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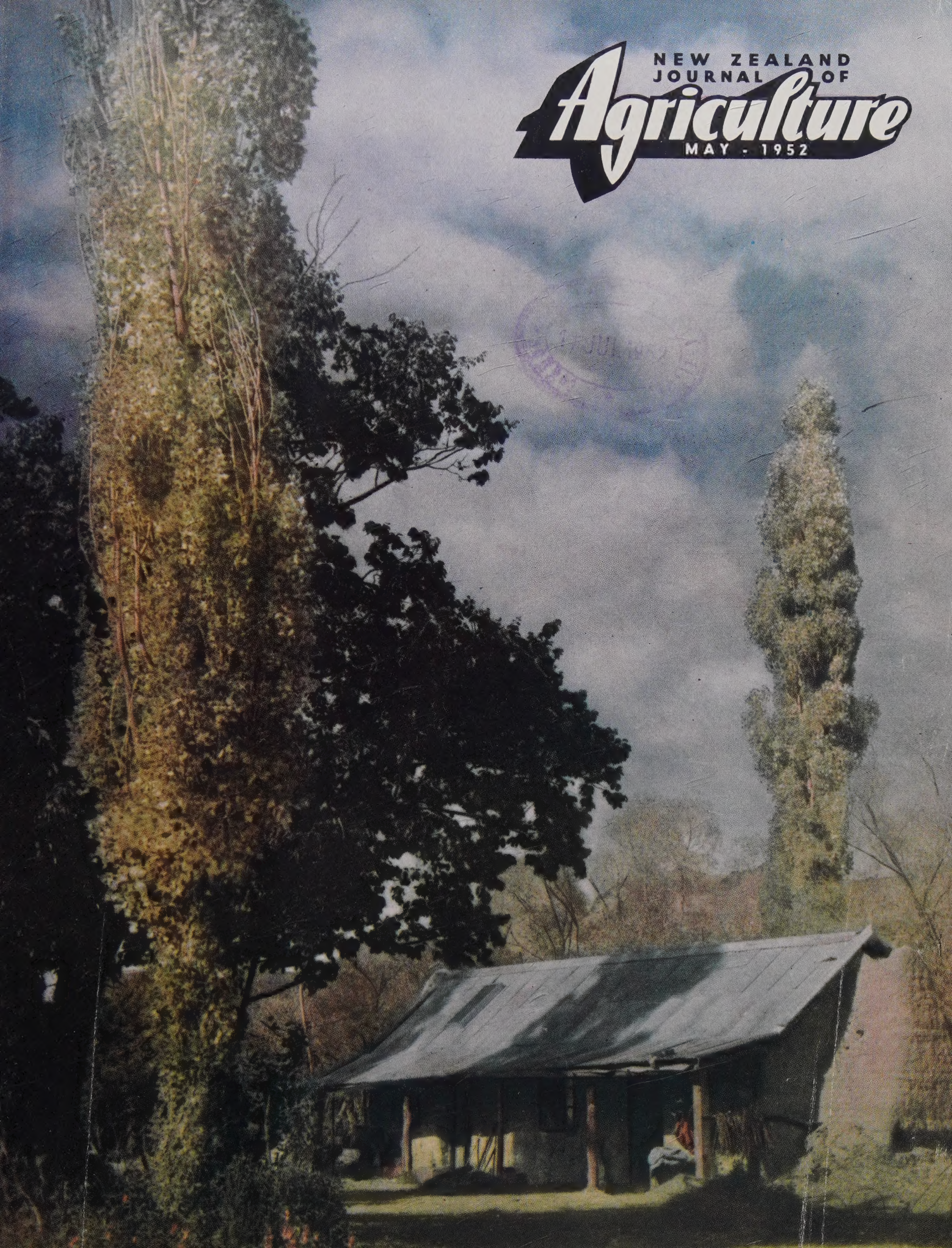
MAY - 1952



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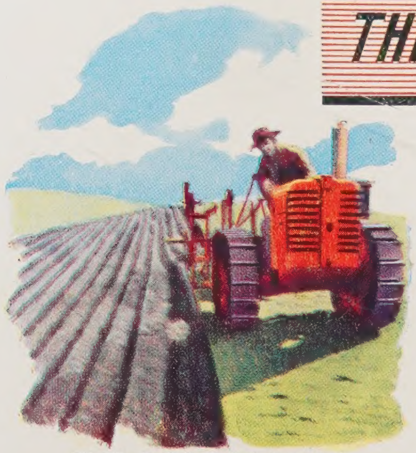

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1952.
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Hon. K. J. Holyoake,
Minister of Agriculture.

This Month's Cover

The original homestead on the Molesworth-Tarndale Runs, built almost 100 years ago by W. Atkinson, the first occupier of the property, is the subject of this month's cover, which has been reproduced from a Flexichrome (Kodak (N.Z.) Ltd.) print by Perry Photographer from a photograph by National Publicity Studios. The runs, which are in the mountainous country of Marlborough, had deteriorated seriously when they were abandoned by the lessees and taken over by the Department of Lands and Survey in 1938. The farming of the runs since has been a major venture in the restoration of depleted tussock country.

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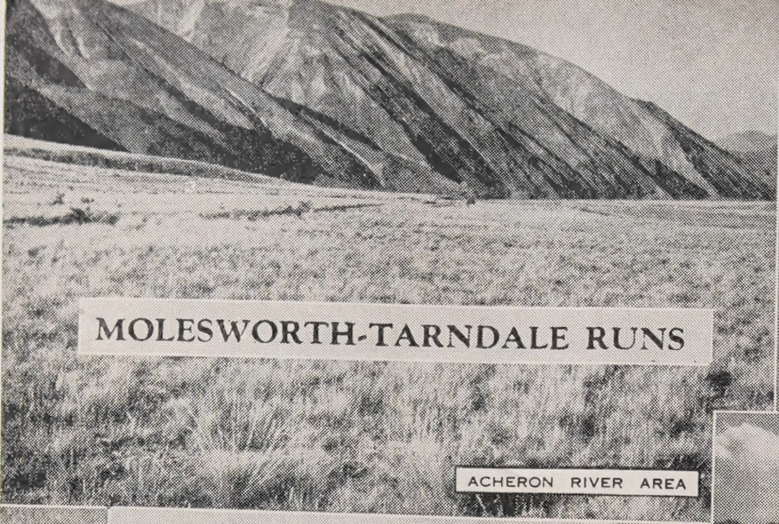
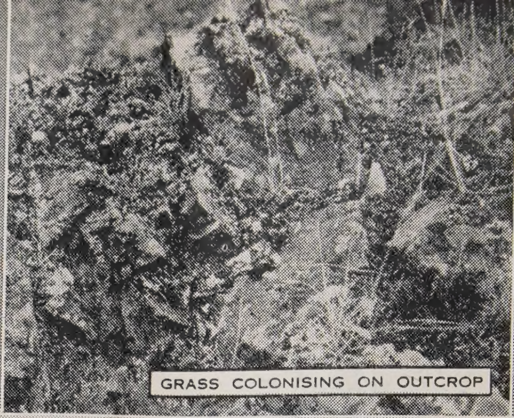
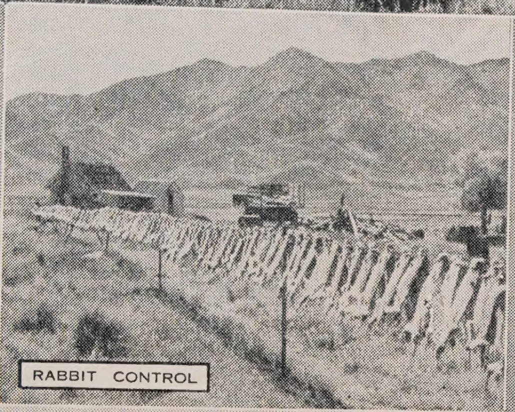
MOLESWORTH-TARNDALE RUNS



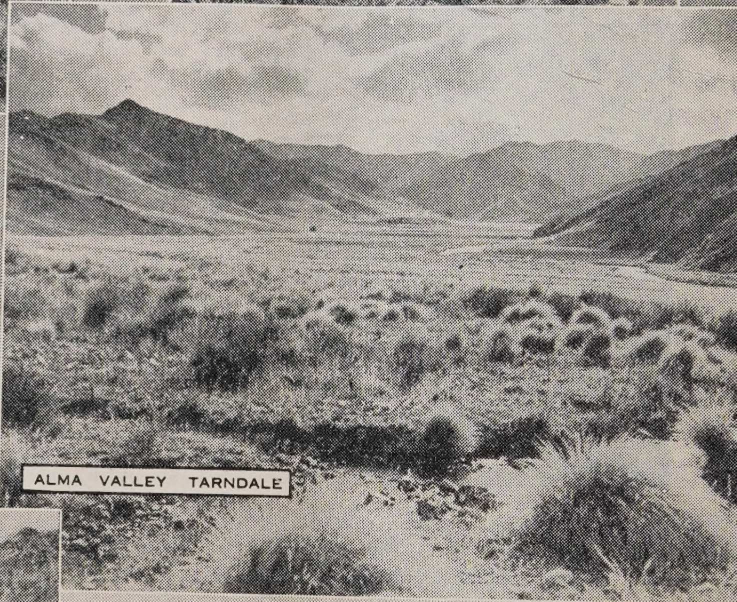
ACHERON RIVER AREA



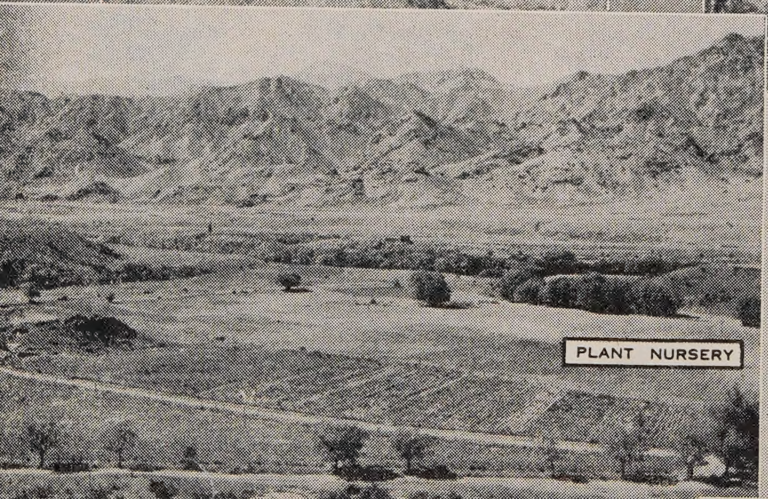
GRASS COLONISING ON OUTCROP



RABBIT CONTROL



ALMA VALLEY TARNDALE

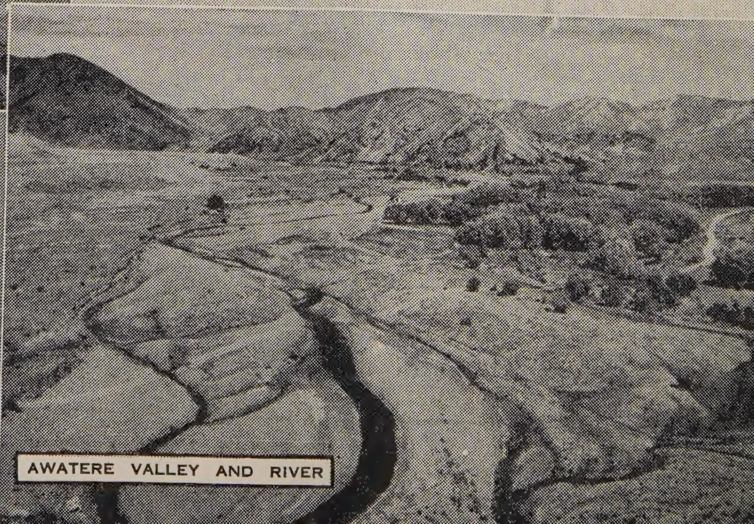


PLANT NURSERY

Molesworth-Tarndale Runs, in the mountainous country of Marlborough, are an example of the menace of soil erosion. Fifty years ago the stations were well stocked and equipped. In 1938 the Department of Lands and Survey took over after the lessees had been forced by economic conditions and soil erosion to abandon the runs. Today the promise of recovery is shown by response to spelling, surface sowing, rabbit control, and elimination of burning off.

[Photographs by National Publicity Studios.

FENCELINE TO IMPROVED AREA



AWATERE VALLEY AND RIVER

The Lesson of the Molesworth-Tarndale Runs

MOLESWORTH-TARNDALE is a centre of interest to high-country farmers in the South Island, but to many whose activities lie in commerce or in New Zealand's more densely settled and highly productive lowlands, particularly in the North Island, it is nothing more than a name. Yet its history has much to teach everyone; it lays bare the truth that man and his agents in a generation can destroy the very sources of his own existence, built slowly and laboriously for his benefit by Nature over past ages.

The Molesworth and Tarndale Runs cover an area of approximately a quarter of a million acres first occupied in 1850. They reached their peak of production about the 1890's, when it is understood that about 50,000 sheep were carried, but from then on deterioration set in, due to the repeated firing of the tussock, over-grazing with sheep, and the depredations of rabbits and deer. The drift continued until 1937, when the stock capacity had dropped to half and the runs were abandoned. At that time they were described as "badly mauled, anaemic, and exhausted".

Although today we are very critical of the action of the early settlers in firing the tussock to obtain fresh growth for their stock, it cannot be said that they followed this practice deliberately without a thought or care for the welfare of the country and future generations. They had no precedent to guide them and they could not foresee the long-range effect of burning. It is only by experience that the difficult and bitter lessons are learned, and it is now known that the flushes of feed that follow the indiscriminate burning of tussock are a short-term gain, ultimately replaced by a total loss.

The first decision made when the runs passed to the control of the Department of Lands and Survey after abandonment was to spell them for a couple of years while the rabbits and deer were brought under control and then to stock lightly with cattle to give the natural cover a chance to regenerate. Regeneration was the prime need, not only to restore the productive capacity but also to check erosion and to reduce the water run-off. Three big rivers which feed into the sea between Kaikoura and Blenheim—the Wairau and its tributaries, including the Rainbow, and the Awatere and the Clarence—rise in the Molesworth country. The denuded landscape was like a tattered umbrella through which the water could pour on to the plains below.

In the first year of the Lands Department's operations nearly 80,000 rabbits were destroyed. The total to date is well over 500,000 without taking into account the mass destruction as a result of poison being spread from the air. Deer have been virtually wiped out and fire no longer plays a part in farming.

Mechanical conservation measures such as contour ploughing and the erection of debris dams have no place on the vast acres of Molesworth-Tarndale 3000 to 7000ft. up in the back country of Marlborough. Nature alone can do what is required, and it has been shown that it will succeed if man helps, not hinders, by keeping those destructive agents (the close-browsing animals sheep and rabbits) off the scene and does not use the match to fire the tussock to obtain a short-sighted and quick return. But man must show infinite patience and allow Nature time to restore what has been lost; and it will take time in these high altitudes where the climate is severe.

Research, of course, has its place. The Department of Agriculture has helped with all the advice possible and the Botany Division of the Department of Scientific and Industrial Research has established a plant nursery at Molesworth and is attempting to select and develop suitable grasses, legumes, and trees which will augment the natural tussock cover and serve the dual purposes of preventing erosion and providing good pasturage and shelter on the steep, barren slopes. The results are encouraging but not spectacular; they cannot be spectacular because of the conditions and the consequent difficulties in establishing and acclimatising new species. There is no fertile seed-bed; cultivation is impossible; the growing season is short; frosts are early and severe, and snow blankets the whole scene in winter.

However, the prizes to be won from the recovery of the Molesworth-Tarndale country are well worth while and the effort and expense fully justified. The expense in any case has not been great.

Labour is always a problem in this out-of-the-way locality, but fortunately there are always the few whose hearts are in the high country and who prefer to work there. Modern innovations, too, have removed much of the tedium and isolation. Aeroplanes are used to drop materials and supplies and to spot cattle in the ranges during musters. Musterers can be directed to mobs tucked away in the valleys and no longer have to range for days in search of stragglers. Radio telephone communication between Molesworth and Tarndale homesteads, which are 25 miles apart, has removed much of the isolation, particularly in winter when snow prevents other means of contact. The value of these modern amenities can be appreciated only by those who have seen or who can visualise a farm 40 miles from end to end. A quarter of a million acres is a lot of land and to this has recently been added the adjoining St. Helen's Run, itself containing another quarter of a million acres. St. Helen's was surrendered to the Crown in 1949 for the same reasons which actuated the surrender of Molesworth-Tarndale. Its history is not dissimilar to that of Molesworth-Tarndale and it presents the same problem.

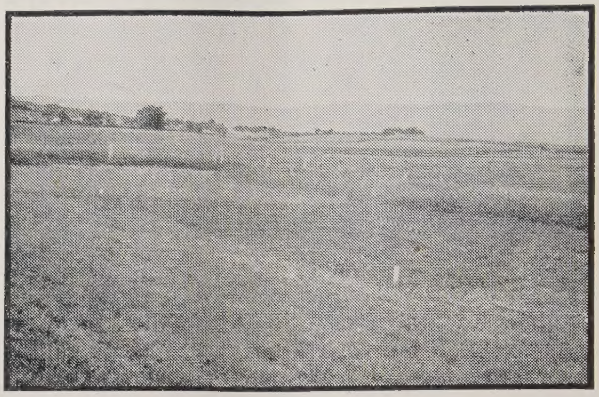
The combined total area of close on 500,000 acres presents a problem of management, but it is a problem that must be faced if for no other reason than to set an example of how this class of country must be handled to retain its productivity.

E. B. CORBETT, Minister of Lands

Molybdenum Investigations in North Otago

By W. R. LOBB, Instructor in Agriculture, Department of Agriculture, Oamaru

CONSIDERABLE interest has been aroused in the use of molybdenum as an aid to increased pasture production. In 1946 the suggestion was first advanced that land which needed excessive liming and which did not grow clover naturally might be deficient in molybdenum. From that time investigations, with which the author has been associated, were started. This article outlines the recent work in North Otago, and gives features of the country in which molybdenum responses are being obtained.



Trial area at Mr. W. McMann's property, showing molybdenum plot to right of pegs and control to left with uncut portions of plots in the background.

THE use of molybdenum may be of importance in the future development of large tracts of semi-marginal and marginal country. There are many blocks of marginal land in Otago and Southland and much research has been devoted to them in the past. Work on the hill country between Outram and Hindon showed that satisfactory pasture establishment could be achieved only by the use of lime applied at rates well beyond those suggested as necessary by chemical analysis. It now appears probable that some, at least, of the problems of this class of land are associated with trace element deficiency. The work which was begun in the Outram-Hindon area in 1946 was followed up on similar country in North Otago in 1951.

The first trial was put down on the property of Messrs. French Bros., Kauru Hill. Here the country reverts very rapidly to browntop, crop failures are common, and turnips and rape often show symptoms typical of whiptail in cauliflowers, a disease which has been attributed to molybdenum deficiency. The soil type is Claremont silt loam and the pasture, although young, was reverting to browntop and sweet vernal, but still contained a considerable amount of white and suckling clovers. A basal dressing of 3cwt. of superphosphate and 1cwt. of muriate of potash per acre was first applied, and duplicate plots were laid down on 3 October 1951.

The response on this trial was pronounced and increases in yield of pasture herbage of over 50 per cent. were obtained to a dressing of 2½oz. per acre of sodium molybdate. This increase was slightly greater than that obtained from 3 tons of lime per acre, but the use of both lime and molybdenum gave better results than either applied alone.

This soil under test was low in calcium, phosphate, and potash, and gave the low figure of 0.03 parts per million of available molybdenum, whereas a tentative figure for a satisfactory available molybdenum level is 0.10 parts per million. A feature of this soil is its immediate response to excessive amounts of lime. This shows up as early as 3 weeks after application, suggesting that some effect other than lime was being involved in the response.

Trial on Lucerne

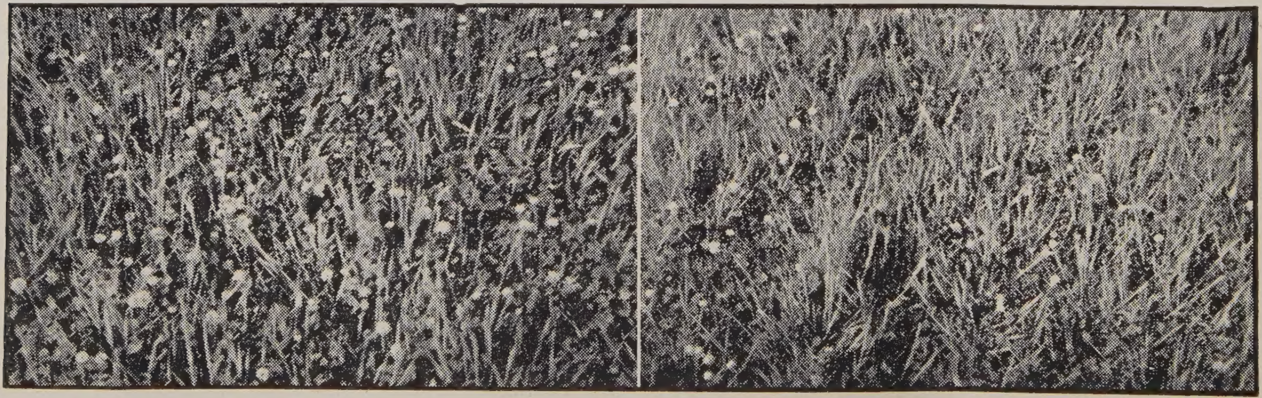
Another trial was conducted on the property of Mr. M. L. Roberts at Queen's Flat, in which plots containing molybdenum alone, molybdenum and lime, molybdenum and superphosphate, and molybdenum and superphosphate and lime were included. The soil type is Kauru silt loam. The trial was put down on 3 July 1951 on an unthrifty lucerne stand, and the report dated 29 October 1951 indicated a very marked response to molybdenum, which appeared to be increased in the presence of superphosphate, but depressed in plots which received lime at 1 ton per acre. The trial was cut and weighed on 28 December 1951 and gave a yield on the molybdenum plots (2½oz. of sodium molybdate per acre) more than four times the yield of the control plots. However, the increase was not nearly as marked on plots receiving lime and superphosphate. This trial has since shown a marked response to boron and it is clear that more work is required on the interaction of all these nutrients before a clear picture of the nutrient requirements of this soil can be obtained.

On the same property a molybdenum response has been recorded on a trial on pasture in the form of better clover growth.

Other Trials

All the following trials have shown marked responses to molybdenum:—

R. Polson, Timaru silt loam; on pasture
R. C. Ruddenklau, Kauru silt loam; on lucerne and on pasture
E. C. Ruddenklau, Kauru silt loam; on pasture
J. P. Rutherford, Claremont silt loam; on pasture
W. McMann, Opuha silt loam; on pasture
J. C. McLean, Opuha silt loam; on lucerne
A. N. Woods, Opuha silt loam; on lucerne
J. Dalziel, Timaru silt loam; on rape
J. M. Milmine, Kauru silt loam; on lucerne
French Bros., Claremont silt loam; on rape
M. L. Roberts, Kauru silt loam; on rape



Left—Close-up of molybdenum plot on 3-year-old pasture at Kauru Hill. Right—Control plot on same pasture.

These responses are very marked and were all apparent at from 3 to 4 weeks after application. There are some slight responses on other trials at Kauru Hill, Airedale, and Island Cliff.

On the trial at McMann's the response is possibly more marked than on French Bros.' Three weeks after application the differences were most marked and at 5 weeks the differences were so great as to make the treated plot quite a respectable hay crop, whereas the other plots would be quite useless for hay. This trial is similar to that at French Bros.' and contains plots of lime 3 tons, lime 3 tons and molybdenum 2½oz., molybdenum 2½oz., and control. All these plots have a basal dressing of 3cwt. of superphosphate and 1cwt. of potash. The response is of the expected order, the best plot being lime and molybdenum, the next molybdenum only, which is nearly equal to the former, and there is quite a marked response to lime alone, but less than half as good as on the two molybdenum plots. There is no response to the basal dressing when compared with the surrounding untreated area.

Mowings were made on this trial, and the weights indicate approximately double the yields of pasture herbage on the molybdenum plots compared with control. Molybdenum alone gave considerably higher yields than lime alone, but the highest yields were from plots receiving both lime and molybdenum.

A trial on young pasture and rape was conducted on the property of R. C. Ruddenklau on Kauru silt loam. An area of the paddock was treated with 2oz. of sodium molybdate by spraying before the crop was sown and a further area was sown with molybdenum-treated seed. The sodium molybdate was mixed with the grass seed mixture and sown at the rate of 2oz. per acre. On both these treated areas there is a remarkable response to the treatment in the growth, vigour, and colour of the rape plants. The young grass and clover plants also appear more vigorous. On the untreated area the rape strike is good, but the plants are pale, stunted, and show symptoms like whiptail. On the treated area they are healthy, dark green, and vigorous and have no such symptoms. Weighings before the crop was fed off indicated an increased yield to molybdenum of more than 75 per cent. The response on this trial was observable at a distance of ½ mile a month after the crop had been sown.

Close-up of lucerne trial on Mr. M. L. Roberts's property.

It would appear from these preliminary trials that molybdenum-deficient areas are widespread in North Otago, responses having been obtained on the range of soils which cover a large part of the area.

Molybdenum-deficient Areas

A common feature on all the country on which molybdenum responses have been obtained is that it usually responds markedly to nitrogen. Such is the case on the acid soils, the cold Southland soils, and the dry North Otago soils. Soils which have been overcropped without adequate lime and fertiliser treatment frequently respond to molybdenum dressings. One of the most pronounced features of the areas giving the responses is the occurrence of so-called nitrogen patches—areas where marked variations of green occur in cereal, brassica, and greenfeed crops and frequently in young pastures. These nitrogen patches do not appear in North Otago to be associated with stock nitrogen and occur in areas which have been under continuous cultivation for four or more years, where a succession of cereal crops has been grown, and where no stock have been carried for some years.

Trial area on Mr. Roberts's property being cut and material collected ready for weighing.

So far molybdenum investigations have been confined to certain soil types and mainly to pastures and lucerne in the district, but they are being extended to cover all the areas and a wide range of crops. Trials have already been initiated on rape, turnips, and kale. The effect of molybdenum on establishment of pastures is being studied by treatment before sowing, by treatment at sowing, applying the molybdenum with the seed, and by treatment after sowing and before emergence.

The rate of application is of some importance, and it would appear that the recommended rate of 2½oz. of 97 per cent. sodium molybdate may be excessive.

Farmers are warned that most of these trials are on areas where the estimated available soil molybdenum is low, under 0.10 parts per million, and for the most part about 0.02 to 0.04 parts per million.

Before any extensive use of the material becomes general it might be as well for farmers to ascertain the molybdenum status of their soils. Soil types in North Otago where low available molybdenum figures have been recorded are Kauru silt loam, Claremont silt loam, Opuha silt loam, Timaru silt loam, and the Waiareka complex. It is possible that other soil types are also low, and these soils are rapidly being investigated.

As excessive molybdenum is in some way associated with copper metabolism in the animal and on non-copper-deficient pastures may induce a train of symptoms similar to copper deficiency, it is essential that caution be exercised in its use. In no case should the recommended amount be exceeded and, if at all possible, the molybdenum status of the soil type should be obtained before widespread application. Farmers could well experiment with lower rates of application when it is realised that rates as low as ⅛oz. per acre may be all that is required.

In reviewing the spectacular results of the trials in progress in North Otago it should be noted that spring and summer 1951 have produced extremely good growing conditions, and it is unlikely that such outstanding success would follow the use of molybdenum under less favourable conditions.

It is unlikely that responses will be obtained on land built up in fertility by heavy liming and topdressing and where a good rotational system of farming has led to high-producing pastures being established and maintained at a high-production level for a number of years. In general, all responses so far have been where pastures run out rapidly although they establish satisfactorily for the first year, or where very low fertility conditions are encountered. Lucerne stands have responded where they tended to fail after the first initial vigour had slumped rapidly.

This article sets out the initial work with molybdenum in North Otago and, although the trials are not replicated and give results for one year only, there is no question of the importance of this element in the future development of the area described.

The assistance given by farmers who have co-operated in this work is gratefully acknowledged.

Care of Livestock during June

Contributed by the Animal Research Division

WINTER FEEDING OF DAIRY COWS

EXPERIMENTS have shown that cows fed well during winter will produce from 26 to 63lb. more butterfat in the following lactation than those which have been poorly fed during winter. These results were obtained when both groups were well fed after calving. It is therefore very important to feed the cows well from now until calving. If plenty of autumn-saved pasture is available, there is no better winter feed, but the primary purpose of this feed is the good nutrition of early calvers in July, August, and September. It should therefore not be used now if that will mean a shortage in those months. If autumn-saved pasture is used, cows should graze it for about an hour per day and in addition should receive 20lb. of silage and 4 to 6lb. of hay. If autumn-saved pasture is not available, cows should be fed as much hay as they will eat, certainly not less than 10lb. in addition to 20lb. of silage. If the winter is a mild one and good grazing is available, silage may be omitted, but ample hay should still be provided.

CARE OF SOWS

Sows and any wintered pigs should be fed on roots plus ½lb. to 1lb. of meat meal per day. Pigs should be kept out of the paddocks when the winter is wet, as pugging of pasture at this time of year will ruin it for spring and summer feeding. Sows due to farrow should be stied and fed what milk is available. After farrowing they should receive up to 5lb. of meal per day plus milk plus roots. Undue economy with meal at this stage will mean light litters at weaning.

LIVER FLUKE IN SHEEP

In areas where sheep become infested with liver fluke flocks should be drenched now. The only effective drug is carbon tetrachloride which should be mixed with 4 times its volume of liquid paraffin. The dose of the mixture is 5 c.c. for sheep of all ages and 1 gallon is enough for about 900 sheep. If only one treatment is to be given, the middle of June is the best time, but if sheep are already showing symptoms, a drench should be given immediately and repeated at the end of July. Further information about liver fluke in sheep and cattle will be found in Bulletin No. 248, which is available from the nearest office of the Department of Agriculture.

WORMS IN LAMBS AND CALVES

Worms are sometimes still troublesome in May and June, and if lambs or calves are not doing well, they should be drenched with phenothiazine at the full dosage rates recommended by the manufacturers. Further information about worms and drenching will be found in Bulletins No. 171 and No. 189, which are obtainable from the nearest office of the Department.

LICE ON POULTRY

Poultry lice can cause considerable loss of condition in birds and reduced egg laying. To control these parasites a fine trickle of 40 per cent. nicotine sulphate should be run along the perches on a calm night before the birds go to roost. Two or three treatments should be given at weekly intervals.

RICKETS IN LAMBS

Lambs in Canterbury and some other South Island districts frequently suffer from rickets when wintered on green oats or barley and occasionally this trouble is experienced on other types of greenfeed. It can be prevented by giving one dose of vitamin D at the beginning of winter. The best preparation is Calciferol and the dose is 25 mg. dissolved in the smallest amount of olive oil which can be given conveniently with the drenching apparatus available. Even when rickets does not occur, this treatment induces much better growth in lambs during winter.

Shepherd drenching lambs at Ruakura

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during March and for the 8 months ended 31 March 1952 with comparative figures for the same month and 8-monthly period of 1950-51, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

		Tons			Total tons in store at
Period	Creamery	Whey	Total	% Inc. or dec.	end of mth.
March 1952 ..	14,025	224	14,249	—	30,520
March 1951 ..	12,930	303	13,233	—	39,940
Inc. or dec. ..	+1,095	—79	+1,016	+7.677	—9,420
For 8 mths. to 31/3/52 ..	142,564	2,335	144,899	—	—
For 8 mths. to 31/3/51 ..	136,225	2,621	138,846	—	—
Inc. or dec. ..	+6,339	—286	+6,053	+4.359	—

CHEESE

		Tons			Total tons in store at
Period	White	Coloured	Total	% Inc. or dec.	end of mth.
March 1952 ..	8,545	51	8,596	—	19,889
March 1951 ..	9,621	7	9,628	—	30,093
Inc. or dec. ..	—1,076	+44	—1,032	—10.718	—10,204
For 8 mths. to 31/3/52 ..	78,439	570	79,009	—	—
For 8 mths. to 31/3/51 ..	85,724	1,526	87,250	—	—
Inc. or dec. ..	—7,285	—956	—8,241	—9.445	—

If these figures are converted into butterfat equivalent, there is an increase of 1.389 per cent. in butterfat graded for the 8 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

Fodder-crop Production: Rationed Grazing of Pastures

Seasonal Notes by the Extension Division

IN late autumn and early winter, time should be devoted to the organisation of next season's crop production and pasture management. Fodder-crop production, pasture renewal, and rationed grazing of dairy cows should be reviewed as steps in planning increased production on dairy farms. There are still very large pasture areas used for dairy farming which could with advantage be ploughed up, sown in winter roots, and then resown with Certified strains of grasses and clovers.

NORTH ISLAND

With the exception of wet soils which should not be touched until they are in a fit state, and possibly of light soils, preparation of ground for spring- and summer-sown root and green forage crops should be started in winter in the North Island. Land that has been in crop previously should be ploughed deep and left to lie fallow until spring. However, if the area is in pasture, the field should be skim ploughed or surface worked with discs or other suitable implements. If it is skimmed, the soil should be left undisturbed for a few weeks, disced to pulverise the turf, and then deep ploughed. When the soil is dry enough in spring it should be worked to a fine state with discs, cultivators, and harrows.

The smaller is the seed to be sown the finer and firmer the seed-bed should be. Rolling of light soils is necessary to obtain a firm seed-bed, and the ground is improved by being rolled before and after being sown. If difficulty is experienced in making the soil fine by surface workings, it will be found that the desired condition can be obtained readily after reploughing. Correct timing of cultivation is particularly important on heavy soils; their tilth is harmed by working when they are too wet, and cultivation is not effective if working is attempted when they are too dry. Delaying sowings until the desired tilth is obtained is usually better than sowing on time on a poorly prepared seed-bed.

—*J. E. BELL*

SOUTH ISLAND

Land for roots and green forage crops should be ploughed in early winter in the South Island to absorb and conserve moisture. Frost has a beneficial effect on soil condition, and subsequent cultivation is reduced to a minimum with the aim of breaking down the soil into a moderately fine, rather loose state in early spring and effecting consolidation with later cultivation.

On areas of good pasture the best method is to hustle and break the turf before winter ploughing. Early-spring working should be done with grubber and drag or heavy harrows. Two or three grubbings are usually necessary to break the furrow slice thoroughly. On browntop country judicious use of discs is essential, the implement being weighted if necessary and having little cut applied to pack the furrow completely, eliminate air pockets, and minimise the amount of turf brought to the surface; later more cut is applied and, if possible, the land is cross-disced to work up a potential seed-bed and at the same time achieve consolidation in the bottom layers of the soil. The application of 1 ton of lime per acre, worked in during subsequent cultivation, is of great value to a root crop. Later cultivation in all cases should aim at conservation of moisture, destruction of weeds, and consolidation, which can usually be achieved with a grubber and harrow.

On the flat the general practice is to roll before drilling the seed, but where weeds are a problem the crop should be ridged. If the soil surface tends toward dryness and particularly cloddiness, discing to incorporate moist with dry soil before putting up the ridges and sowing is advisable. When rape follows these crops—the general practice—the land should be grubbed immediately the stock are off and deep ploughed to allow time for some late-winter frost action; cultivation before sowing is then similar to that already described.

—*R. C. SCHOFIELD*

RATIONED GRAZING

SINCE THE INTRODUCTION of the electric fence for break feeding of pasture and crop areas very rapid changes have taken place in simplifying and improving the equipment required. With light, portable electric fence units, push-down insulated standards with No. 12- or No. 14-gauge plain wire, and reels for tightening the wire at various lengths, manipulation of the fence calls for little extra time and labour on the part of the farmer. In fact, the many advantages of the system, which include increased fertility and build-up in pasture quality and improved pasture and crop utilisation, more than warrant its introduction on any dairy farm in New Zealand.

Changes are also taking place in the techniques or set-outs of fences for breaking feed areas, and more efficient methods are coming into use as experience is gained on dairy farms in New Zealand and overseas countries. These improved set-outs, giving more efficient management of pasture and crop areas, are of considerable importance even though the basic principles of the system are similar.

BREAK FEEDING

The set-out of a fence for the feeding off of saved pastures depends to some extent on the access of the stock to water. This is important, but it does not present great difficulty on most dairy farms, especially where the water troughs are placed in the permanent fencelines. Availability of water in the field is perhaps less important in winter if grass is abundant and silage is being fed, but it should be available at the shed.

Simple set-outs giving triangular breaks on rectangular fields, and triangular breaks rotated round a central fixed post on square or odd-shaped fields, have given fairly good efficiency in the feeding off of pastures with a minimum of effort. However, farm experience appears to suggest that very narrow rectangular breaks lead to much more efficient grazing over the whole break area each day than do triangular breaks, on which the wider base, particularly where the angle is very wide, tends to be grazed less efficiently than the narrow space. Therefore the trend is toward working with the one fence moved at both ends to provide a narrow rectangular break, varying with the size and shape of the field, the amount of feed available, and the number of cows to be fed. On crop areas the narrow-strip method offers the greatest possibilities of good utilisation with a minimum of fouling of the crop by the stock.

—*J. M. HOPKINS*

The Home Garden in June

By C. L. NAPIER, Horticultural Instructor, Department of Agriculture, Hastings

MOST SOILS will not be in fit condition for sowing and planting in June, so gardeners should take the opportunity of preparing for the busy season ahead. Garden planning should begin early in the season and gardeners can follow up last month's activities with all the small preparatory tasks that go to make the sowing and planting season so much easier. Outside activities will probably be curtailed in many districts and much otherwise-idle time can be spent in the tool shed constructing seed boxes and garden frames and sterilising soil in preparation for seed sowing.

DIGGING should be under way this month, though local climatic conditions will determine whether a start can be made. Early soil preparation is important, particularly if green crops are to be turned in, as fresh organic matter is given adequate time to decompose before subsequent vegetable crops are planted. Digging serves many purposes, a few of which are:—

It is a useful method of incorporating organic matter with the soil.

It assists in breaking up heavy soils and improves aeration and drainage in all soils.

It tends to increase the depth of the top fertile layer of the soil, thus providing a deeper and better rooting medium for plants.

There are several rules for digging which should be followed. It is unwise to work soil that is very wet. Wet soils, particularly the heavy types, become puggy or sticky if walked on continuously and are very difficult to restore to good structure after such treatment. The type of digging to be adopted depends largely on the type of soil to be worked. Most topsoils are deep enough to permit ordinary digging of one spit in depth without the subsoil being disturbed. Without prior treatment most subsoils are unsuitable for satisfactory growth and it is unwise to mix much of them with topsoil. On flat land it is best not to dig in the same direction each year. If this is done, a definite slope will be created and a very uneven soil surface can result.

If the garden is on sloping land, leaving the soil rough or forming it into ridges assists in reducing water run-off during winter. On a slope some form of permanent ridging may be possible and will assist early warming of the soil and distribution of irrigation water during summer.

Forms of Digging

There are three different forms or methods of digging, each of which has its place in gardening.

Ordinary digging consists of turning over the top layer of the soil to a depth of one spit (the full length of the spade blade). Care should be taken to keep the general level of the dug soil as even as possible, and the soil should be turned toward any hollows that may have developed during the previous season. Ordinary digging is usually sufficient preparation where drainage is good, the subsoil is open and of good texture, and the topsoil is over one spit deep.

Double digging is very similar to ordinary digging, but includes loosening up the subsoil in the bottom of each trench opened up. Each trench must be opened up cleanly and should be reasonably wide so that the width of the spade or fork will fit across it comfortably. Double digging is valuable for improving drainage and aeration and it also assists in deepening gradually a naturally shallow topsoil. Liberal quantities of organic matter in the form of plant refuse, animal manures, or compost can be incorporated in the subsoil as it is turned over. In this way the fertile soil will be increased in depth and a deeper rooting medium will be provided for plants.

Trenching takes two forms, full trenching and deep trenching, both of which have their value in home gardening. Full trenching consists first of digging a trench two spits deep. The top spit from the next trench is turned into the bottom of the first trench and the bottom spit from the second trench is then brought to the top of the first trench. This method is satisfactory only where the topsoil is two spits or more deep. Clay subsoil in quantity should not be brought to the surface, because it may seriously affect the texture and fertility of the soil.

[*R. W. Orr photo.*

Above—Turning over the subsoil as in double digging and deep digging. At left—During winter as many vegetables should be produced as during summer.

[*Green and Hahn Photography Ltd. photo.*

Deep trenching is a rather long and tedious operation and for this reason is seldom done. However, it is a valuable way of improving drainage and aeration and in some soils may be necessary sooner or later. Deep trenching is done throughout a depth of three spits. First, a trench two spits deep is dug and the top spit removed from a second trench. By standing in the deeper trench the gardener then digs over the bottom of it to the depth of a further spit. Organic matter can be incorporated as the soil is turned over. The second spit of the second trench is then turned into the first trench and the top of a third trench used to complete the first. With deep trenching in contrast to full trenching, the soil is returned in its original order. Deep trenching can be a means of destroying some perennial weeds, such as couch and Californian thistle, which can be incorporated in the lower spit as it is turned over.

Liming

When it is considered necessary lime can be applied to the soil at time of digging. It can be applied at any time, but to be of value in the growing season it must be applied early. It should also be incorporated as thoroughly as possible with the soil, if quick response from it is required.

Lime can be used for many purposes; it provides plant food in the form of calcium, it assists in improving the structure of some soils, and when present in the correct quantity it encourages the activity of soil micro-organisms. It also assists in making available other plant foods, such as phosphorus and potash.

Applications of lime usually are more necessary on light soils, very heavy or clayey soils, or soils in high-rainfall areas. Most good loams are usually fairly well supplied with lime, but an occasional light dressing is beneficial. Ordinary crushed or agricultural lime is the best form to use for general work and can be applied at 4oz. to the square yard. Burnt lime is sometimes used in home gardens, but this form if used regularly will quickly reduce the organic-matter content of the soil. It is also harmful to plant tissue.

Drainage Important

Without adequate and efficient drainage no amount of digging, fertilising, or any other garden operation will bring plants to successful maturity. This does not mean that all soils need draining. Most soils have good natural drainage, but some drain poorly for various reasons. Impervious subsoil, hollows in the ground, and naturally low-lying ground near higher ground from which seepage may come can all contribute to wet soil conditions. Excess water restricts aeration, tends to break down the soil structure, and may help to leach out some plant foods and cause an excess of others. It tends to make the soil colder and slows down warming up of it in spring. Excess water can restrict the activity of earthworms and micro-organisms, which is so valuable in fertile soils. Finally, wet soils are difficult to work and during the wetter periods of the year cultivation may be impossible.

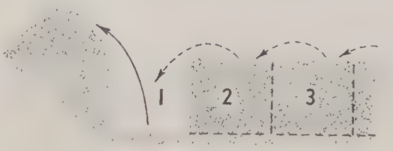
Presence of surface water does not necessarily indicate poor drainage. An excessively high water-table (the natural level of the free water in the soil) is sufficient to cause trouble as also will the continued leaching of underground water from higher ground. As there is naturally more water about at this time of year, gardeners can now make a close examination of their plots, if inefficient drainage is suspected. A few holes dug about the garden to the depth of a few feet will often assist in the detection of excess water. Garden soils should have a water-table not much less than 2ft. from the surface. Shortly after heavy rain the level naturally would be higher, but it should return to normal in about 24 hours. In determining the natural level of the water-table gardeners should be guided by their local soil types and soil profiles.

How to Drain

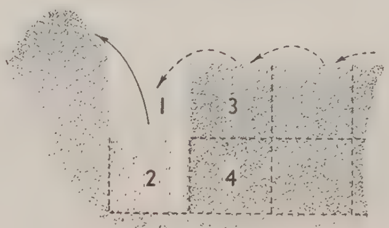
Whatever system of drainage is used it should carry away the excess water efficiently and quickly. The drainage system should not be so deep that the water-table is lowered to a dangerous level nor so shallow that it is ineffective and also interferes with cultivation. To be most effective the system should cut across the flow of water, if this is known. If a series of drains is dug running with the flow, it is possible for excess water always to be present between the drains. Where a drainage system is adopted it is usual to construct some part of it as the main and the remaining parts as subsidiaries running into the main. These are usually called the laterals or minors. When a drainage system is being planned several points should be borne in mind. First, the lay of the land will affect the whole system, and on flat country draining may be more difficult than on a slight slope. The positions of outlets are also important, because the depth of these in relation to the watercourse into which they are draining will affect the whole system. Protection of the outlet should also be considered, as a blocked drain is useless. The fall and arrangement of the minors are important, particularly if tile drains are used. Too great a fall may cause scouring as water forces its way out between the ends of the tiles and too little fall may allow silting of the pipes to occur. Depth and distance apart of the minors are perhaps the most important factors to consider, as they have the greatest effect on the lowering of the water-table. The deeper the minors and the closer they are together the more effective the system will be. However, both must be considered carefully, as in some cases light soils and peats can be overdrained.

Whatever the type of filling used all drains should be dug very carefully. Fall and evenness of fall are very important and these should be watched as digging proceeds. If the topsoil is not too deep or the subsoil is impervious, so that water flows across it, the drain should be dug into the subsoil. This practice will break the flow of water. Careful levelling of the drain bed ensures efficient drainage, particularly if the bed is in firm soil. A firm and even bed is most important, especially where tile drains are to be used, as uneven settling of the tiles will throw them out of alignment, thus reducing their efficiency.

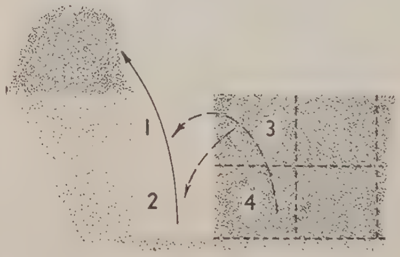
Methods of Digging



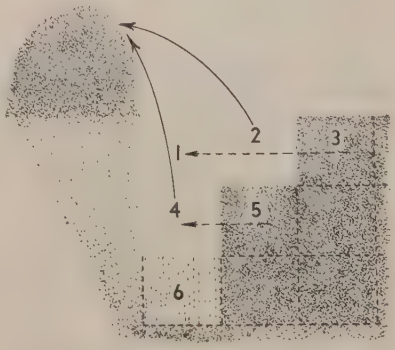
Ordinary digging. Remove 1 and throw it forward; 2 is thrown into the trench formed by removing 1, and the procedure is continued with 3 and succeeding spadefuls.



Double digging. The top spit (1) is removed; the second spit (2) is not removed, but is broken up and enriched. Then 3 is turned into 1 and 4 is treated in the same manner as 2. This procedure is continued to the end of the plot.



Full trenching. Soil two spits deep (1 and 2) is removed, 3 is thrown into the position from which 2 was taken and 4 into the position from which 1 was taken. The procedure is repeated until the plot has been dealt with.



Deep trenching. Soil is taken out from 1, 2, and 4; 6 is broken up and enriched; 5 is placed in 4, and 3 in 1. This method of working is continued to the end of the plot.

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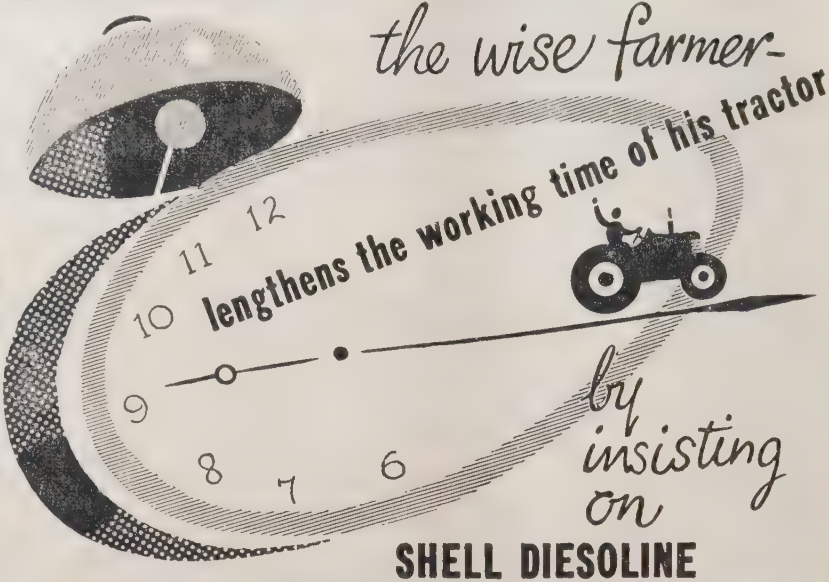

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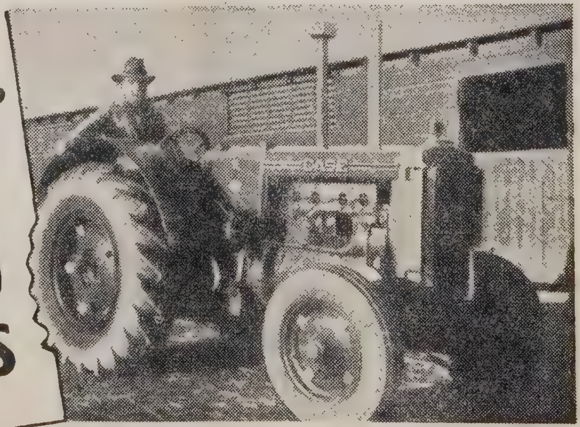

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Types of Drains

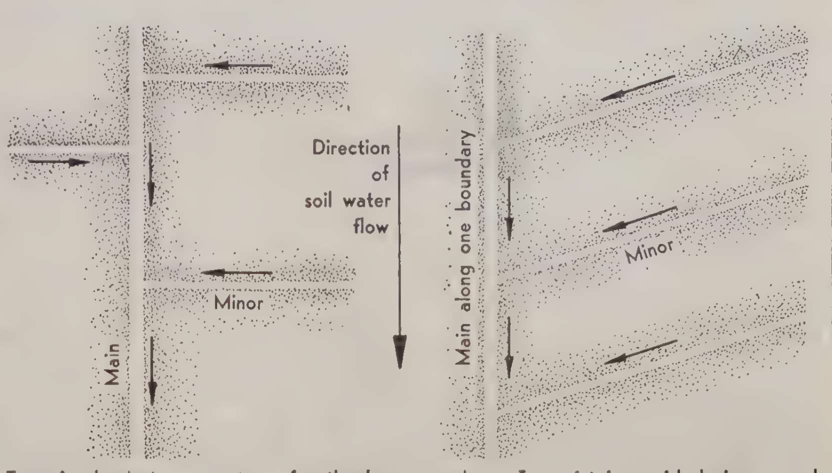
Many types of drains can be used in the home garden, but tile, moraine, brush, and timber are probably the most suitable.

Tile drains are perhaps the most expensive, but over a period will be the most effective and longest lasting. Usually clay tiles of 3in. diameter are sufficiently large for home garden drainage and should be laid end to end touching each other. The ends of clay tiles are usually uneven, and after they have been laid there is sufficient space between them to allow percolation of water into the drain. It is advisable to cover tiles with some rough material such as grass sods, straw, or brush before the soil is returned, particularly if the soil is silty or clayey. This will prevent the sifting of fine soil grains into the system before the soil has time to consolidate.

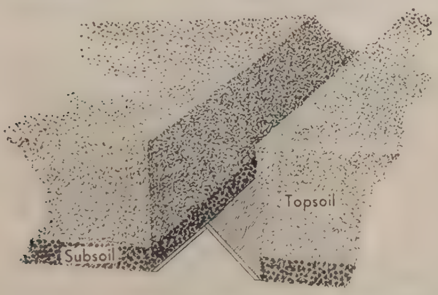
Moraine drains can be constructed from old bricks, stones, and other similar rough, long-lasting material. Some type of brush or small metal chips should be placed over the coarser material to prevent soil from settling into it.

Scrub or brush drains are very effective and last for considerable periods. Manuka brush, coarse hedge trimmings, or light trimmings from trees are all suitable and should be packed down firmly. A topping of straw or similar material should be made as with the tile drains.

Timbered drains are probably the most suitable on light soils and are easily constructed. Timbered drains were laid in the early days in New Zealand and remained effective for many years. Perhaps the simplest type is two planks of similar width nailed at right angles to each other and placed in the trench like an inverted V.



Two simple drainage systems for the home garden. To assist in rapid drainage and prevent possible silting up, minors should join mains at an angle of approximately 45 degrees.



A simple drain constructed from two planks joined in the shape of an inverted V. The timber can be replaced by field tiles, broken bricks, stones, or brush.

Soil Sterilisation

From the necessity for more effective methods of disease and pest control has evolved the practice of soil sterilisation. The term "sterilisation" describes a process which is only partial sterilisation, because sterile soil would be void of even beneficial bacteria. Sterilisation is carried out mainly with soils used under glass that are continuously and heavily cropped each year and with soils used for seed sowing, potting, and pricking out of seedlings.

Sterilisation by steam or chemicals reduces in varying degrees attacks by diseases such as damping off, verticillium and fusarium wilts, some viruses, and pests such as eelworm, wireworm, and grass-grubs, and kills most weed seeds.

All soil to be sterilised should be fine, friable, and moderately moist. Glasshouse soils should be friable to a depth of at least 18in. if the full benefit of the sterilising agent is to be gained. Where chemicals, particularly chloropicrin, are being used results are best when soil temperatures are at least 60 degrees F.

Once soil is sterilised great care should be taken to prevent it from coming in contact with dirty boxes, bins, pots, or soil, as reinfestation and reinfection of the soil will occur quickly.

Steam Sterilisation

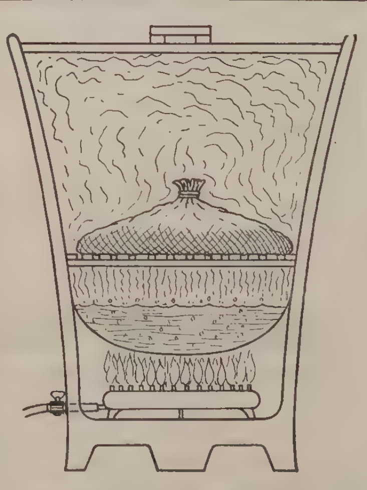
Steam is the most effective sterilising agent. It gives good control of soil fungi and pests and some viruses and also kills most weed seeds. To kill all undesirable life in the soil and yet not destroy the beneficial bacteria temperatures must be maintained at 170 degrees F. for 10 minutes. As beneficial bacteria, such as the nitrifying ones, are killed when boiling point is reached, soil should not be heated above 170 degrees F.

Home garden glasshouse soils are difficult to steam unless the correct apparatus is available. However, gardeners can sterilise small quantities of soil (sufficient for propagation purposes) in the washhouse copper. The diagram at right illustrates how the copper is used. The soil bag is resting on a wooden grid, which is a few inches above the water surface. With this method only about half a fruit case of soil can be sterilised satisfactorily at one time. The soil is best enclosed in an open-weave bag if the steaming is to be effective. A maximum of 3 gallons of water in the copper should suffice and this should be brought to the boil as quickly as possible. The soil should be cooled off quickly after sterilisation by spreading it over a clean floor. Gardeners who require sterilised soil continuously could build steam-sterilising apparatus similar to the copper arrangement out of a 44-gallon drum.

Chemical Sterilisation

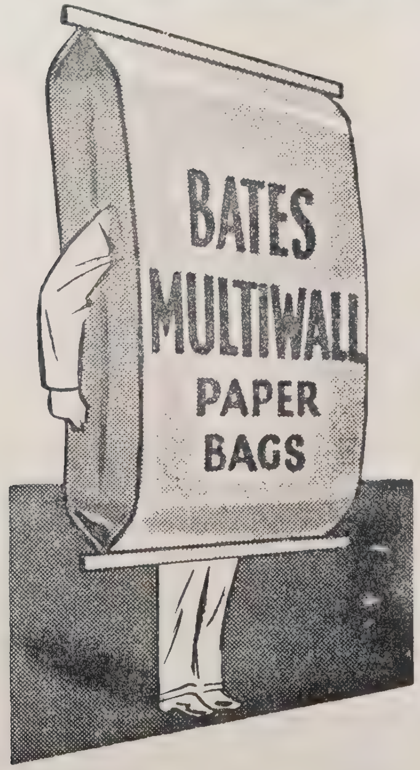
Chemical sterilisation (more correctly termed fumigation) includes the use of a number of different substances, only a few of which are suitable for use in the home garden.

Formalin is one of the most common chemicals used, but unfortunately is reasonably effective against soil fungi only. Home garden glasshouse soils can be fumigated easily with formalin by saturating the soil with a solution immediately digging is completed. It is best to break the soil up into a fine, friable condition and to saturate it with a solution of 1 part of formalin to 49 parts of water. The solution should be applied at the rate of 50 gallons to each 15 sq. yds. Wet sacks placed over the soil will tend to retain the vapours and ensure better results. The house should then be closed up. After 3 or 4 days the house should be opened and the soil turned over thoroughly once or twice to release all traces of the chemical before planting.



Half-bushel lots of soil can be sterilised satisfactorily in the domestic copper. For best results the soil should not be put in thick sacks.

RIGHT DRESS FOR FERTILIZER



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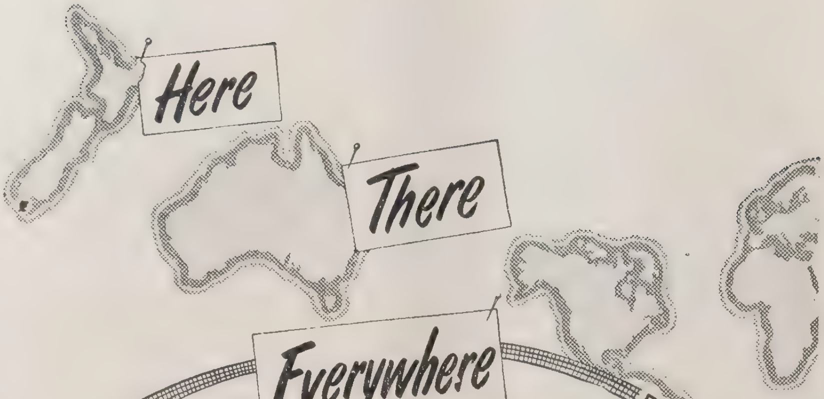

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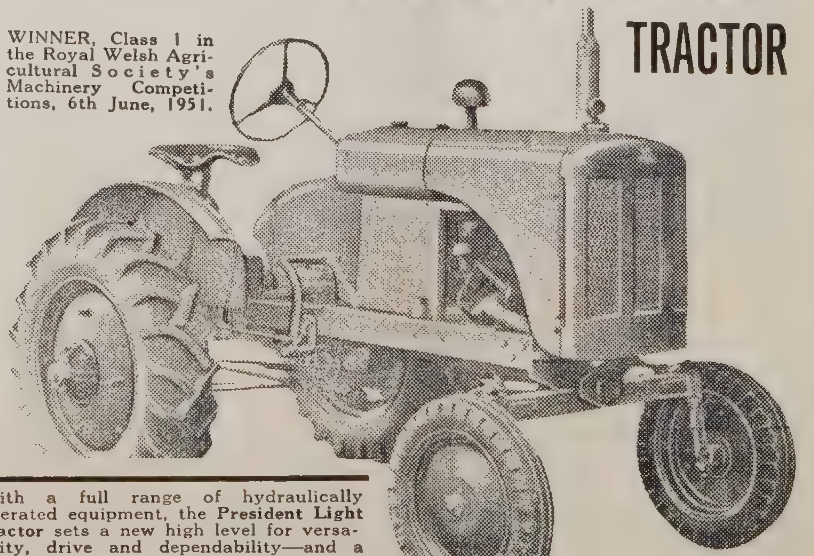

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Planting should not be done within 3 or 4 weeks of fumigating.

Soil for propagating purposes can be fumigated very easily with formalin in a large metal drum. As fine, friable soil is shovelled into the drum it can be saturated with formalin solution. The drum should then be topped off with wet sacks to prevent rapid dispersion of the fumes.

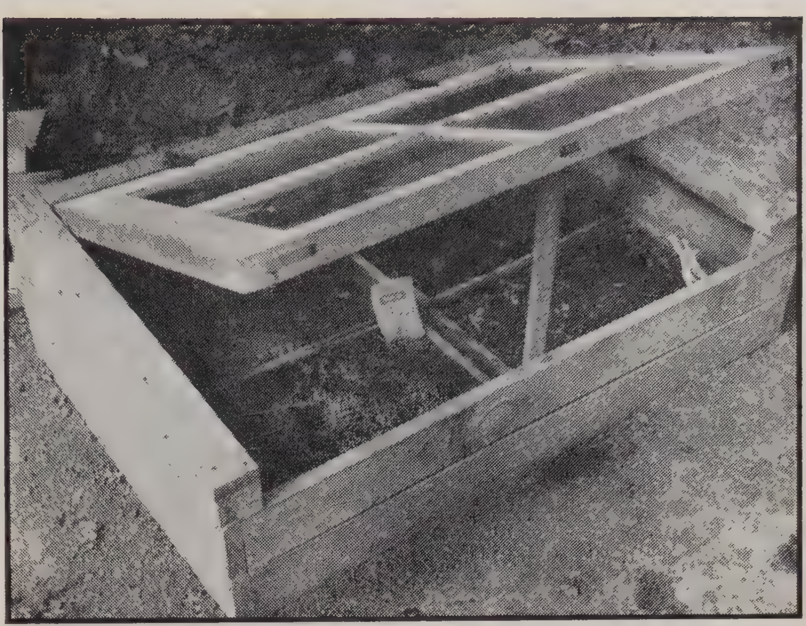
Chloropicrin, commonly known as tear gas, is a valuable chemical for the control of most soil pests, fungi, and weed seeds. Because of its irritating nature, chloropicrin is rather uncomfortable to use. When used for glasshouse soil fumigation it is best applied through an injector specially designed for the purpose. A recommended dosage rate is about 1 teaspoon to every 10in. at a depth of 4 to 6in. Dosage rates and depths vary somewhat according to the severity of the disease or pest and type of soil. After each injection is made the hole should be sealed with soil. The treated soil surface should then be sealed further by wetting it with water or covering it with wet sacks. After a week or two the soil should be aerated by forking and then left for another fortnight before being used. When chloropicrin is used the house should be ventilated fully before it is entered.

Small lots of soil for seed sowing can be fumigated in drums with chloropicrin in a similar manner to that employed with formalin. As each 6in. layer of soil is put in an estimated amount of the chemical can be poured over it and the next layer of soil shovelled in quickly. The drum should be sealed with wet sacks. Half a pound of chloropicrin per cubic yard is equal to about 5 teaspoonsful per cubic foot.

Chloropicrin fumes can be dangerous and should not be inhaled.

Fumigation of Glasshouse Frames and Boxes

Fumigation of all structures and wooden objects associated with the growing of plants should be carried out periodically if plant diseases are to be kept to a minimum. Glasshouses, compost bins, and frames are best washed or sprayed with a 2 per cent. solution of formalin so that the solution reaches every crack and crevice. Excess dirt should be removed before treatment is given. As formalin vapours can injure plant growth, all structures should be empty when treated. Seedling boxes are best treated by immersing them in the solution in a large drum; alternatively they may be scrubbed with the solution. If boxes cannot be left in the solution for an hour or two, they should be stacked closely in the tool shed for a few days after immersion and then dried off outside. Fumigation of structures used for growing plants eliminates many fungous spores which otherwise might set up infection within the plants.



[R. W. Orr photo.

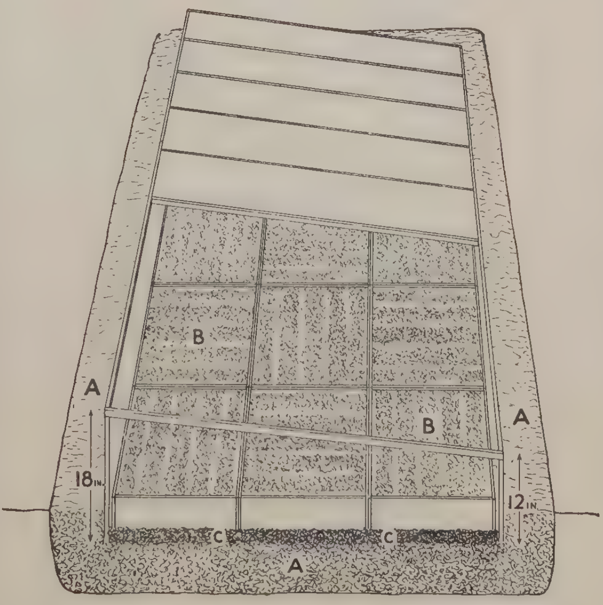
A simple movable frame constructed from a spare window frame and large enough for 4 seed boxes.

Frames and Hot-beds

The raising of seeds in the home garden can often be difficult and some special assistance is sometimes valuable. Besides speeding up seed raising, hot-beds and frames can improve germination by providing better conditions for growth. They also allow germination when outside conditions might not be desirable. Frames are also useful for the striking of various cuttings that might otherwise be lost because of poor striking conditions. Frames need not be elaborate and should be only large enough to supply sufficient plants. Construction can be simple, as shown in the illustration above. In this instance an old window was used and the whole structure was built to take 4 ordinary seed trays, which normally are 14in. x 19in. x 2¼in. Frames are best made movable so that they can be placed in suitable positions as required. They should always face the sun to gain maximum warmth.

Hot-beds are the home gardener's equivalent to the nurseryman's heated frames or glasshouses. They are valuable for quick raising of seedlings, the growing of some vegetables such as vine crops, and the raising of kumaras. The construction of a hot-bed is illustrated at **left**. Fresh stable manure has been proved the most effective material for generating the heat, and it should be neither too wet nor too dry. Before being incorporated in the bed the manure should be turned several times to assist aeration, which in turn increases the heat. When the mass is uniformly heated it can be built into the heap and slightly firmed. The presence of the small quantity of straw or other dry organic matter in stable manure assists in keeping even heat. The best temperature is about 65 degrees F.

If an adequate layer of soil is applied over the manure, seeds or seedlings can be planted directly into this soil. Seed boxes can otherwise be placed on the light layer of soil as illustrated in the diagram. For best results the original layer of manure should be about 3ft. thick, which later will settle down to about 2ft. It is best to place the frame on the thick



Frame on simply constructed hot-bed. A—Stable manure to provide heat. B—Seed boxes. C—Light layer of soil over manure.

[R. W. Orr photo

With large seed boxes such as that at left seedlings are often wasted. The small box at right holds 30 plants, which is sufficient for most gardens, and is easy to handle.

layer of manure and then to pack more manure and soil about the frame to seal any gaps. The manure should be allowed to settle somewhat before the top layer of soil is applied and the sash should remain open to allow excess heat and gases to pass off. Any movable seedling frame can be used over a hot-bed.

Seed Boxes

Most gardeners usually raise far more seedlings than they require. For this reason, if seed boxes are being used, it is advisable to have them no larger than necessary. Small boxes are usually sufficient to provide enough plants for most families; larger ones will provide enough plants for each successional planting. Gardeners should not lose sight of the fact that successional, small sowings and plantings are often more satisfactory than single, large ones, as fewer vegetables tend to be wasted. The normal-size seed box previously referred to and one with dimensions 9in. x 8in. x 4in. are shown in the illustration above. The latter box contains 30 pricked-out lettuce seedlings, sufficient for one planting in any garden. From the larger box some 60 tomato plants were planted out from the upper side of the box and the remainder were eventually thrown out. Small boxes tend to save seed, are much easier for the housewife to move, and are convenient for her for the sowing of flower seeds.

Boxes should be constructed of durable timber, if they are expected to last, but should not be watertight. If no drainage is allowed, excess moisture will rot the boxes quickly. Boxes which have been used and which are not required again for some time should be cleaned, dried, and stored in a tidy stack.

Reminders for June

Unless conditions are very favourable in June, gardeners should sow and plant with caution. In localities experiencing frosts severe damage can be done to young seedlings by the lifting of the soil about them. Damage to and reduction of crops can occur also where heavy rains are experienced. As soil and air conditions are cold at this time of year, gardeners in most localities will not gain any time by sowing or planting, as growth will be very slow. It is common for later-planted crops to mature with, or even ahead of, crops sown earlier during the colder weather.

Seeds to Sow

Lettuce: Raising of plants for early-spring cutting can begin this month. Seed is best sown in boxes placed in frames or in a warm corner under a sheet of glass. If large frames are available, production of heads within them may be advisable. Imperial 615, Neapolitan Winter Market, and All Year Round are suitable varieties.

Onions: Seed can be sown for the production of spring crops, preferably in raised beds, frames, or boxes. A little seed sown broadcast in a raised bed in a sheltered position should provide all the plants required for spring salads.

Beetroot: If conditions are favourable, a small sowing of beetroot will provide roots for early-spring consumption. As beetroot does not do very well in temperatures below 40 degrees F., sowings should not be made indiscriminately. Detroit Dark Red and Early Wonder are suitable varieties and seed should be sown as thinly as possible as most "seeds" are actually a ball of several seeds. Beetroot does best on lighter soils enriched with organic matter.

Cabbages and cauliflowers: Cabbage seed of the summer type, such as Golden Acre, can be sown in frames, boxes, or well-drained beds. Cauliflower seed of Phenomenal Early or Early Snowball also can be sown this month for planting out in August. Seed is best sown in drills, which can be close together if raised beds are used. If seed is sown thinly and in drills, plants will be sturdy and comparatively free from diseases.

Plantings

Potatoes: In very mild localities a few early potatoes can be set out in June. Epicure and Cliffs Kidney are suitable varieties. At this time of year tubers should not be set deeper than 4in., as soil conditions might not be very desirable. Moulding up as soon as planting is completed will assist drainage and provide a greater surface for warming up by the sun. Government-certified seed should be procured when possible.

Cabbages and cauliflowers: Late plantings of spring cabbages can still be made, preferably on ridges to assist drainage. Cauliflowers such as Walcheren and All Seasons can also be set out in a manner similar to that for cabbages, but greater distances between rows and plants should be allowed.

Other Work

Seed potatoes (Government-certified) should be set out in shallow trays with the rose end (end opposite the stalk end) of each tuber uppermost. The greening and stout growths that will result will tend to give a better strike when the potatoes are planted next month. Trays should be placed on shelves in an airy shed.

Small lots of broad beans, spinach, peas, radish, carrots, and turnips can be sown in suitable localities.

All stored vegetables and those remaining in the soil should be inspected regularly for development of disease.

A special effort should be made this month to eradicate any perennial weeds, and all winter weeds should be kept down by regular cultivation.

Harvesting of any crops not already gathered should be completed.

Seeds for the coming season can be purchased and stored away from vermin. Orders should be placed for main-crop potatoes and manures for the coming season and stocks of spray materials such as Bordeaux mixture, D.D.T., lead arsenate, sulphurs, and summer and winter oils replenished.

All winter crops must be watched for attacks by pests and diseases. Any tools and equipment overlooked last month can be cleaned and repaired.

The Basis of Disease Prevention on the Poultry Farm

MOST poultry farmers tend to think of diseases as being placed in a series of compartments, preferably those to which names may be given. That may result from the habit of writers on the subject publishing articles on specific diseases under specific titles. Such a description is valuable and necessary, but unless a farmer has a flock affected by the disease discussed or has suffered loss from it in previous years he is likely to skim over it casually. Similarly, if he studies a book on poultry diseases, particularly during a period when birds are being lost, he is likely to find at least half a dozen diseases the symptoms of which appear applicable to his flock. This article introduces a series by J. J. Thompson, Veterinarian, Department of Agriculture, Wellington, in which the primary object will be to approach the subject of disease prevention from the point of view of the man on the poultry farm, and not merely to bombard him with theoretical recommendations. The aim will be to focus attention on faults often observed on New Zealand farms rather than to give complete descriptions of what should be done. Prevention of disease enters into the everyday life of the poultry farmer, being closely allied with management, hygiene, housing, and in particular feeding of the birds.

Poultry Instructors of the Department of Agriculture are available for consultation about problems concerning the housing and health of flocks.

EVERY disease is not an entity which can be given an individual name such as leucosis, pullorum disease, or coccidiosis. Frequently a poultry farmer will say: "No, I haven't any disease in my flock, but the birds aren't doing too well". The terms "subclinical" used by the veterinary surgeon and "not doing too well" used by the farmer correspond closely. Both imply that no definite symptoms are present, but that the birds' health is subnormal.

This necessitates a change in the common conception of disease to the view that any departure from normal health or loss of normal body function may be called disease. If a bird goes off feed or laying for any reason, it may be said to be diseased.

Counting the Cost

Almost every article about diseases of poultry begins with a homily on the cost of disease to the industry and quotes remarkable figures which, however, fail to make any impression on the average reader unless he has the ability to digest statistics. But let him count the loss on his own farm, remembering to include every unthrifty cull as a diseased bird (as its poor condition or inability to lay stamps it as such) and to take into account times when egg production dropped because of such causes as an outbreak of colds or poor feeding, apart from the heavy loss which may result from an outbreak of a disease such as fowl pox, leucosis, or fowl cholera. If he does this conscientiously, he may decide to give up poultry keeping for some other less risky livelihood.

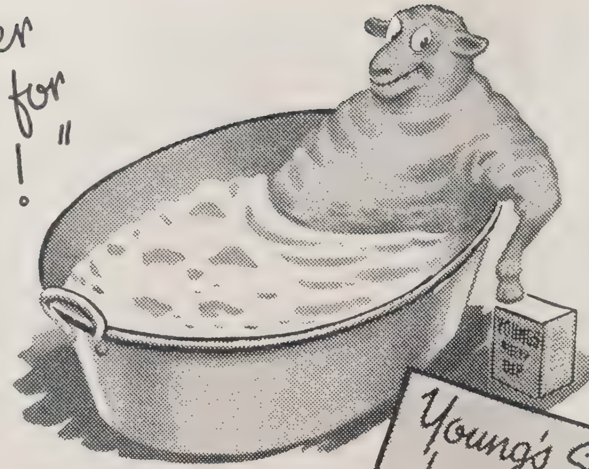
Only breeding birds selected to a high standard of health and constitution can be expected to produce high-grade progeny. Even then birds must be culled regularly from the time they are a day old.

However, the purpose of this series of articles is not to cause despondency in the poultry industry, but rather to draw attention to the necessity for taking all reasonable precautions to prevent disease. That is the aspect which the advisory staff of the Department of Agriculture emphasises. Little satisfaction can be gained from contemplating treatment of a diseased, ravaged flock which cannot be treated economically or at best can produce birds which are fit only for culling.

Breeding Stock

The primary object of the New Zealand Poultry Flock Improvement Plan is the selection of healthy birds for breeding stock. Unless the parent stock is of sound constitution and healthy, the chicks cannot be good. Poor chicks are soft and susceptible to disease, and can never progress well. The temptation to make up the numbers in breeding pens from second-class birds to fill an incubator or meet orders must be resisted.

Even a relative newcomer to poultry keeping can recognise a healthy bird by the bright eyes, good development, and quick, lively appearance. Birds which sit about in corners or on perches moping, show no eagerness for food, and are poorly developed must be culled. Culling calls for much skill and practice, and Poultry Instructors are keen to help and teach poultry farmers who doubt their own ability to select breeding birds. Healthy parents are only one link, but a vital one, in the chain which leads to virile chicks.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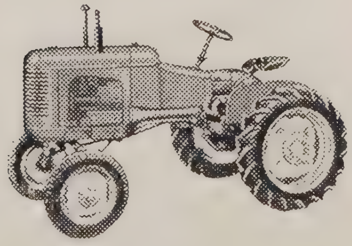

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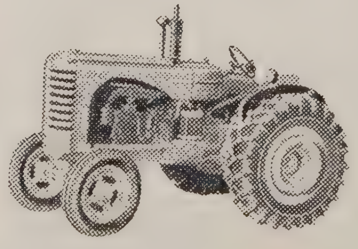

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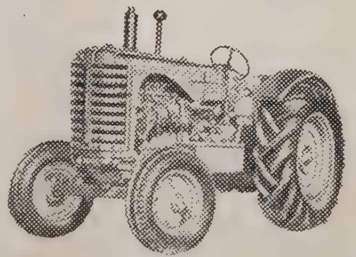

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Two birds of the same age from the same pen. The difference between their appearances indicates that the bird on the right should be culled.

At the Department's Poultry Demonstration Plant, Upper Hutt, where progeny testing is being carried out, individual recording has revealed startling differences in livability between the progeny of different birds. These facts cannot be ascertained under conditions of mass mating, but if mortality in a flock kept under good conditions is unusually high, poor livability, a genetic character, must be suspected. Avian leucosis is the greatest cause of loss to the industry, and the Department is endeavouring to establish at the Poultry Demonstration Plant strains of Black Orpingtons and White Leghorns which will be resistant to this disease. If this can be accomplished, distribution of cockerels to the industry should help to raise the degree of resistance in individual flocks, but such a scheme is a long-term one and calls for patient work.

Recording Losses

Every producer should keep a record of flock mortality at all stages, from day old onward, to enable him to compute his loss through disease. If the loss is above average, obviously either the environment (sanitation, housing, and feeding) is at fault or the flock is showing poor livability. In most such flocks environment is to blame and outside advice should be sought to help correct faults.

A disease-recording system has been instituted by the Department which involves little extra work. Any producer can take advantage of this system by applying to his local Poultry Instructor for information. Any abnormal loss is then investigated by Departmental officers and every assistance given toward helping to reduce losses. All information given is regarded as confidential.

Diseases Spread by Live Birds

Measures of disinfection which can be applied to houses and to feeding and watering utensils unfortunately cannot be extended to the live bird, which is the likeliest carrier of infection of most diseases, though it may not be obviously affected. Numerous examples can be quoted. In fowl cholera the causal organism pasteurella is easily killed by ordinary disinfection measures in the house, and even if no such measures are taken, it will die out in a short time, but the bird which has recovered from the disease frequently becomes a carrier and may infect disease-free pullet flocks the following year.

Pasteurella organisms are often associated in New Zealand flocks with outbreaks of coryza or "roup", many of which have been caused by allowing older stock in a carrier state to mix with young birds for a short time. Such outbreaks may have drastic effects on the health and economic value of young pullets. The same feature applies to many of the bacterial diseases, and also to those caused by parasites such as coccidia or worms.

A bird affected by coryza caused by pasteurella organisms. If it recovers, it may remain a carrier of the disease and infect healthy birds.

The so-called cull bird is another source of danger arising from the live bird. In removing poor or unhealthy birds the poultry farmer is taking away a potential source of infection to healthy stock. If the flock is exposed to any contagious disease, the cull bird is usually the first to contract it and acts as an "incubator" from which infection is spread to healthy birds which otherwise would have sufficient resistance to withstand infection.

Culling should be enforced from the day-old chick stage onward. Poultry Instructors will gladly help farmers who are uncertain which birds should be culled.

Resistance to Disease

The widening use of the terms "resistant" and "susceptible" indicates the increasing attention being paid to disease problems, but different aspects of resistance to disease are sometimes confused. Resistance is the opposition put up by the tissues of an animal or bird to invading organisms such as bacteria, viruses, or parasites such as worms or coccidia. Different forms of resistance are recognised.

Genetic resistance is controlled or influenced by the genetic make-up or breeding of the bird. Strains resistant to avian leucosis, pullorum disease, fowl typhoid, and other diseases have been built up by scientific breeding. Conversely, strains susceptible to these diseases can also be bred.

Breed resistance: Some breeds are more resistant or susceptible to certain diseases than others. In New Zealand a well-known example is the White Leghorn, which is more resistant to pullorum disease but less resistant to avian leucosis than is the Black Orpington.

Age resistance is well exemplified in parasitic diseases. Worms and coccidiosis may cause severe losses in young birds kept on infested pastures or in infested houses. As the age of the birds increases the resistance grows, and adult birds on the same ground would show little adverse result.

Environment and Resistance

Poor housing, insufficient food, a diet deficient in protein, minerals, and vitamins, or bad management will cause a lowering of the bird's natural resistance to disease. The effect of any disease outbreak is accentuated considerably when the birds are kept in a poor environment. Chilling lowers a chick's resistance to pullorum disease; vitamin A deficiency increases susceptibility to colds.

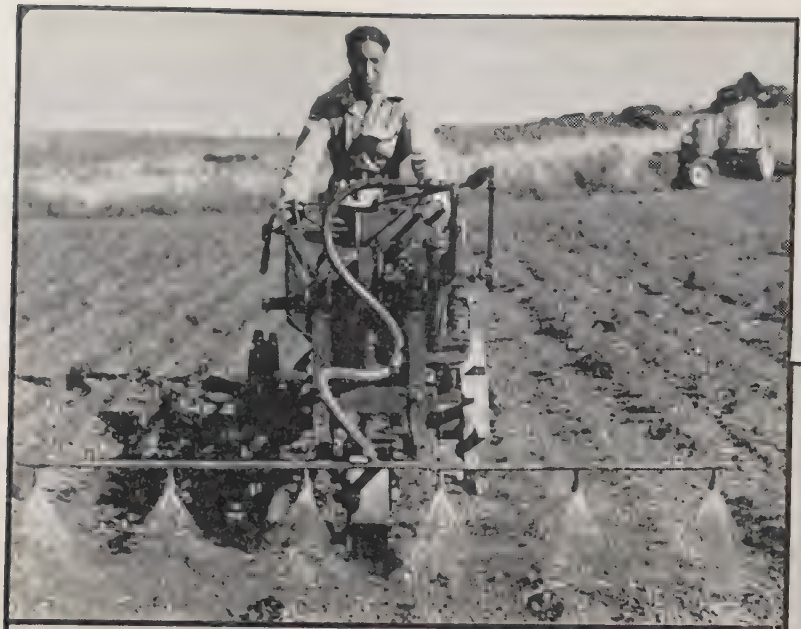
Poultry farmers are sometimes influenced by the knowledge that a farm they have visited appears to have no disease problem despite poor housing or dirty conditions. It is not always easy to offer reasons for this apparent immunity in contrast with a farm on which sanitation measures are of average efficiency. If the germs are not present, the disease will not appear despite poor conditions. Some farms are simply fortunate that their flocks have escaped infection; should infection be introduced, lack of sanitation and other measures will lead to heavy loss.

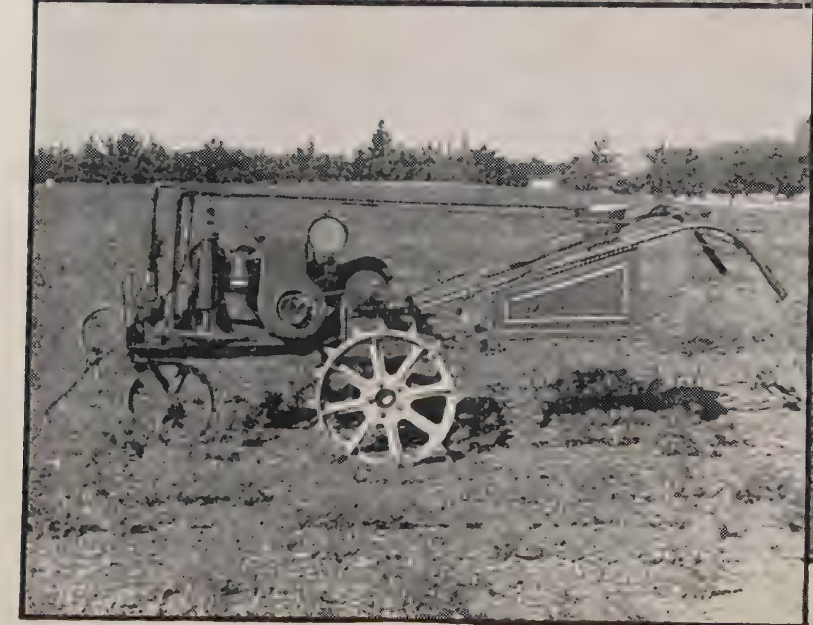
A flock which is not producing heavily is also much more able to withstand disease than is a flock with high production. A barnyard fowl laying a moderate number of eggs has greater resistance than a heavily laying bird kept under commercial conditions.

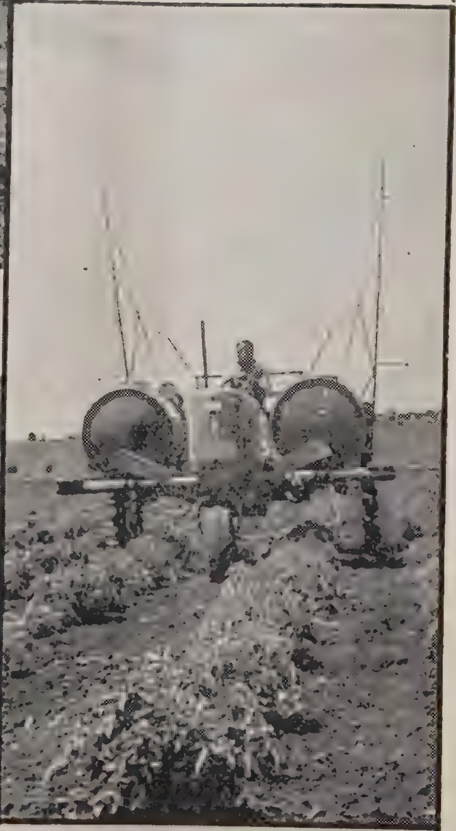
Another factor which may be significant is the standard of feeding. A farm on which a good strain of birds is fed on an efficient, balanced diet may show better results than an apparently well-run farm on which feeding is unsatisfactory.

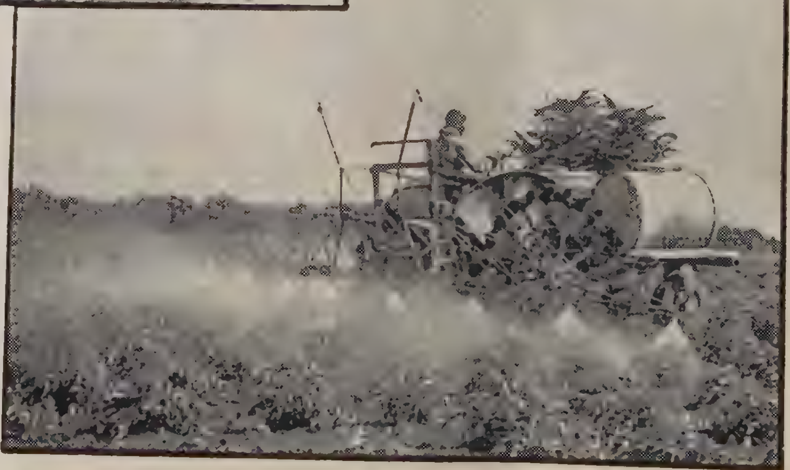
Finally, it is not unusual for the inefficient poultry keeper to conceal the extent of his losses.

SPRAYING APPLIANCES IN USE AT PUKEKOHE









Upper left—The mechanical 6-row crop sprayer. Lower left—Side view of the 6-row crop sprayer. Upper right—The large mechanical sprayer, with spray booms raised to enable the machine to pass through narrow gateways. "Tip-toe" main wheels are considered an advantage. Lower right — The large mechanical sprayer in action.

[My Bonnie Studios photos.

Spraying Appliances on Pukekohe Market Gardens

CONTROL of pests and diseases is a major problem on Pukekohe market gardens. The mild climate is ideal for the breeding of insects and the high humidity favours growth and spread of fungous diseases. Weeds also thrive on the highly fertilised gardens, and chemical sprays are applied whenever possible for their control. Under these conditions efficient spraying apparatus which will give an adequate coverage of spray in as short a time as possible is essential. In this article T. C. R. Dawe, Horticultural Instructor, Department of Agriculture, Pukekohe, describes some of the types of equipment in use.

VARIOUS types of spraying equipment are used, and generally there is a move toward the use of more efficient sprayers, particularly those of the mobile type.

Knapsack Sprayer

The knapsack sprayer has many uses on a market garden. It is used to a great extent for spraying young crops, plants in seed-beds, and crops of small area.

Most knapsack sprayers are fitted with a dual cyclone nozzle, which gives a good coverage with fine droplets of spray and adequate force for penetration if correct pressure is maintained in the pump. The hand shut-off valve release has been found to be much more efficient than the screw-tap type. If care is taken to maintain the pump in good mechanical order and it is thoroughly cleaned after use, years of useful work can be obtained from this reasonably priced efficient sprayer.

Horse-drawn Barrel Sprayers

Horse-drawn barrel sprayers are used on Pukekohe gardens, mostly by growers with small areas. When the equipment is in good mechanical order approximately 8 acres of row crop can be sprayed in an 8-hour day. It is possible to apply 100 gallons of spray per hour per acre with the type of barrel sprayer illustrated. This type of equipment is very useful when the weather is so wet that tractor types are somewhat handicapped. This, however, is a rare occurrence in Pukekohe district. Pressure of approximately 150lb. per sq. in. can be maintained with this barrel sprayer. Three cyclone nozzles are directed to each row, one on each side within 6in. of the ground, pointing inward and slightly upward, and one directly on to the top of the row. Three rows of plants may be covered at a time.

The knapsack sprayer.

Mechanical 6-row Crop Sprayer

The small mechanical 6-row crop sprayer illustrated is mounted on a 3 h.p. tractor fitted with a Bean pump; 100lb. pressure can be maintained. An area of from 5 to 6 acres can be treated in an 8-hour day with this outfit. It has a tank capacity of 6 gallons and is fitted with six cyclone nozzles, one directly over each row. It is rigged to cover rows 12in. apart, which is the usual distance between rows for root and onion crops in this district.

This appliance is used for spraying various crops with insecticides, fungicides, and weedicides. The spray boom may be raised or lowered according to the height of the crop.

Large Mechanical Sprayer

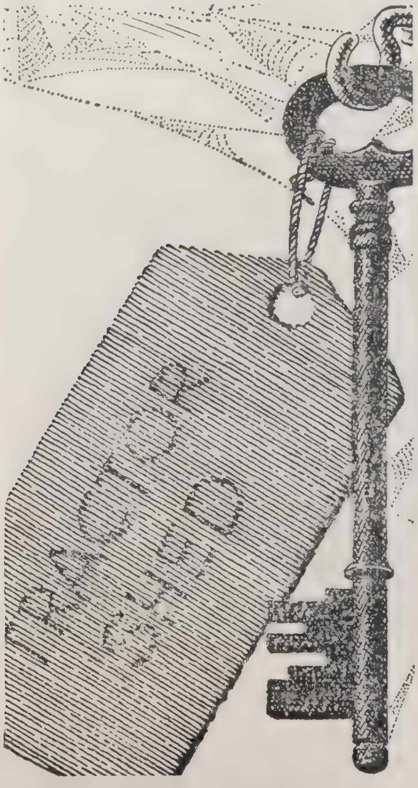
The large mechanical sprayer illustrated is very efficient and can be used on most row crops such as potatoes, tomatoes, and cabbages. It is fitted with two 100-gallon tanks complete with agitators. A Bean pump is driven from the power take-off and can maintain a pressure of approximately 300lb. per sq. in. An area of 3 to 4 acres can be sprayed in an hour with an application of 120 gallons per acre. The boom is adjustable and can be arranged to spray 8 rows of tomatoes or 12 rows of potatoes. Lifting of the boom to enable the machine to pass through gateways is controlled by levers on the tractor. One man can operate this machine, but for maximum efficiency it is usual to have some assistance for refilling.

Apart from the knapsack sprayer, the spraying appliances illustrated have been built to suit local conditions.

It is difficult to suggest any spraying appliance to suit all conditions, and growers should study local requirements carefully before buying equipment. Complete coverage of crops with spray material is particularly important.

[My Bonnie Studios photo.

Horse-drawn barrel sprayer.



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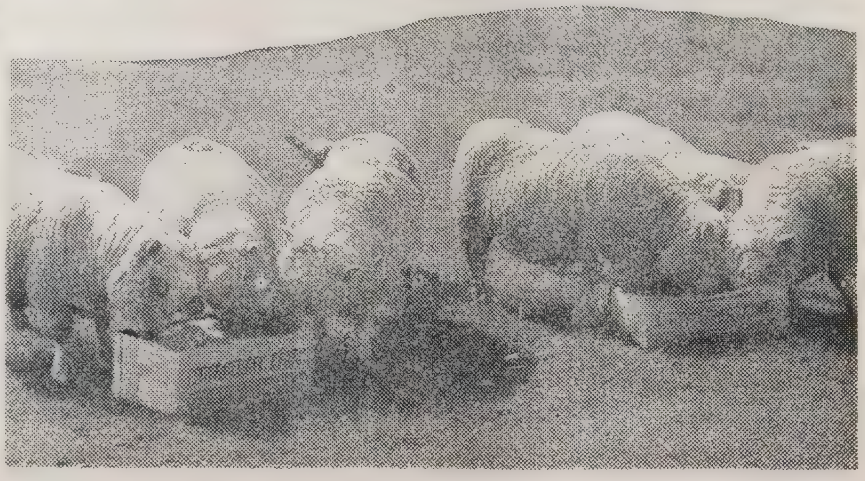

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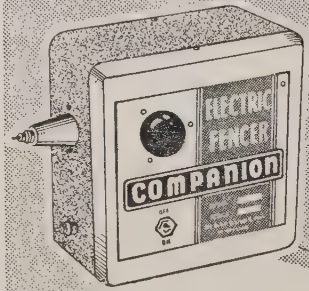

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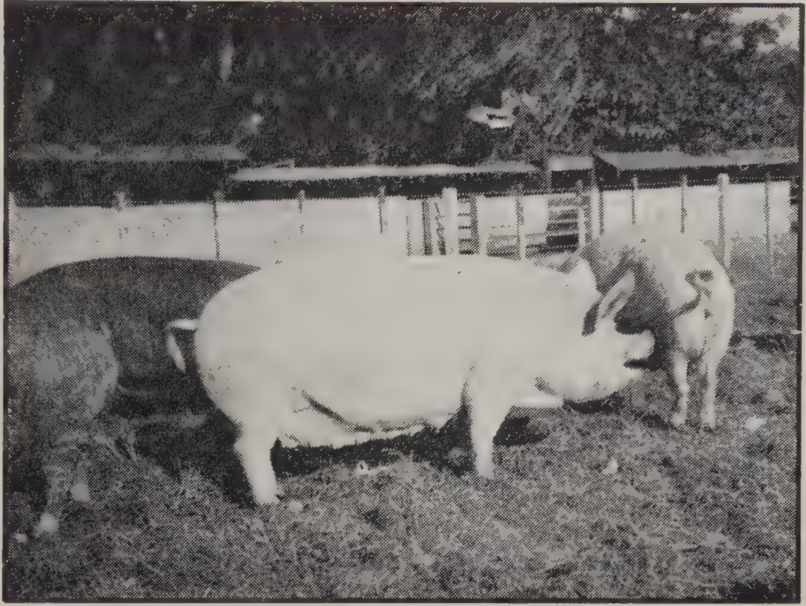

THE importance of performance records in the selection of pigs for breeding was dealt with in a previous issue. It is equally important that breeding stock should be given every chance of performing well on the farm of the purchaser by receiving good treatment. In this article I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, deals with this aspect of pig production.

BEFORE the farmer goes to the trouble and expense of buying good pigs for breeding he should see that the conditions under which he intends to keep them are such that they will have an opportunity, at least, of repaying him for the care he has taken in their selection. This should be obvious to everybody, but in many cases it apparently is not, and, despite the fact that quite a high price may have been paid for a boar or a sow, the treatment that it receives from its new owner is such that it has very little chance of producing satisfactorily.

Making Use of Pasture

Under the grassland system of farming practised in the Dominion pastures of very high quality have been developed and these pastures are most valuable for breeding pigs. The small paddock, either full of weeds, often noxious ones, or completely bare of vegetation, which is used so frequently for the dry sows and boar is of no value to them. There is no reason why pigs should not be grazed in the cow paddocks. Rooting can be stopped without difficulty by ringing the animals; a small copper ring made in the same way as a bull ring should be used. The ring is placed through the nostrils, not in the snout, and will, apart from accidents, in most cases last the life of the animal. Wire twisted through the snout is useless, as it lasts only a short time and becomes progressively more difficult to replace, as the pigs become fully aware of their owner's intentions and put up an increasingly strenuous resistance to the operation.

In addition to the very valuable feed that pigs obtain from grazing on good clover pasture (which of course represents a direct saving to the farmer of meal, skimmed milk, or crops), they will derive great benefit from the exercise involved. Lack of exercise probably is a contributory cause of trouble to in-pig sows at farrowing time and causes boars to become so fat and unwieldy as to be virtually useless. Under natural conditions all pregnant animals get plenty of exercise and suffer from few troubles at parturition.

Though access to good drinking water is of the greatest importance, provision of it is often neglected. Troughs for cattle are often too high for pigs, and unless good creeks are available, special troughs should be provided. A gallon or two of skimmed milk once or twice a day is not a substitute for good drinking water. Pigs will drink a considerable amount of water—not large quantities at a time, but small amounts frequently.

Housing

The main requirement in housing used for dry sows and boars is that it should provide a warm and dry place for pigs to sleep. They can be housed in a unit of the main piggery or a special unit built on to it or in movable

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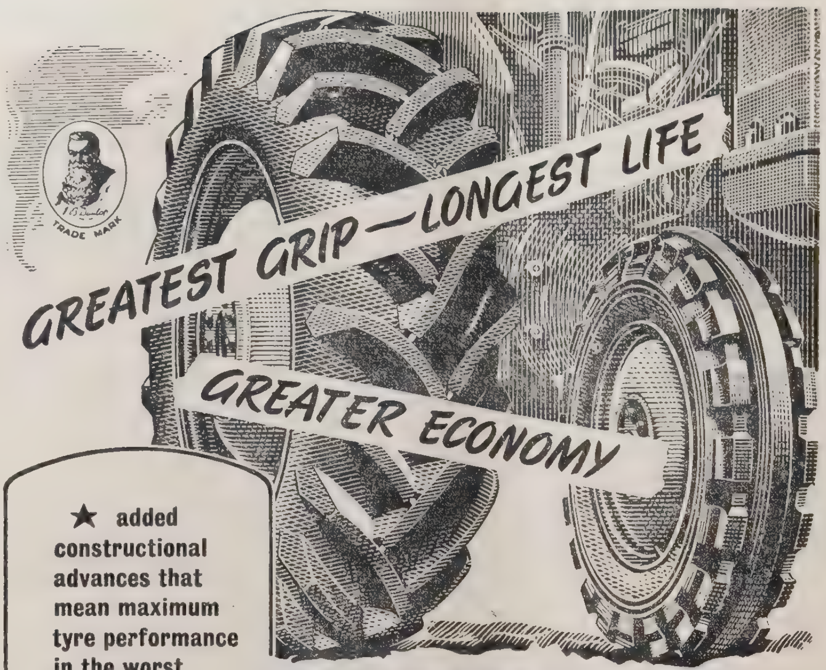

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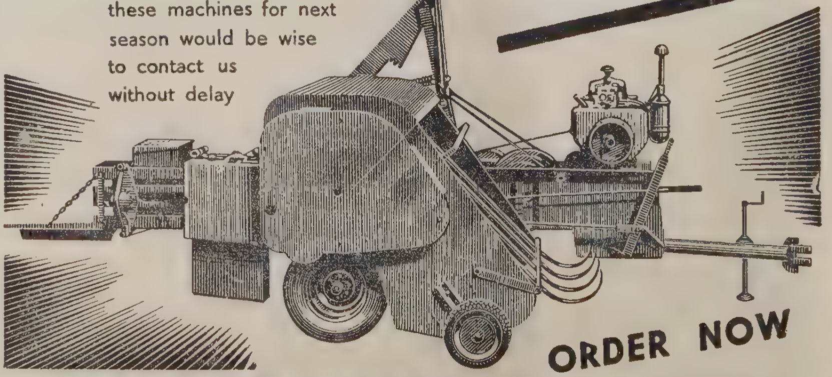

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houses in the paddocks. In hot weather in-pig sows need to be able to get protection from sunshine. They will suffer considerably if they have no access to shade. A clean creek in which they can wallow is a great asset.

Feeding

It is impossible to state exact rations to be fed to in-pig sows and boars, as their individual requirements vary greatly. Observation on the part of the farmer and knowledge of his stock are the only reliable guide to the quantities that should be given. During the first 6 weeks after sows have been served an endeavour should be made to build them up and to replace condition that they lost while suckling litters; almost all good sows lose condition while rearing a litter. To build up sows effectively individual feeding bails should be used, as these prevent fighting and bullying at the trough, ensure that each pig gets a fair share, and enable special treatment to be given to any individual that requires it.

The bails and feeding yard should be built at the most convenient point for feeding. No difficulty is ever experienced in getting pigs to come for their feed, provided reasonably regular times are kept. Feeding twice a day is all that is necessary, and if the stock has access to really good pasture and drinking water, one feed a day is satisfactory, at any rate after reasonable condition has been regained. It is better when one feed is being supplied to give the dairy by-products or meals in the evening. Home-grown crops can be fed at the most convenient time, and with some crops the stock can be turned in on them.

The following daily rations in food units are given as a guide to the quantities required by in-pig breeding sows:—

	* Food units
During first 5 weeks after weaning or until satisfactory condition regained	6
During next 10 weeks	2
During last 2 weeks before farrowing	Up to 6, according to condition. If skimmed milk is not being fed, this should include 2lb meat [illegible] per day

Grazing on good pasture should be supplied with each of these rations.

* 1 food unit = 1 gal. skimmed milk, 1½ gal. whey, 1lb. good-quality meal, 5lb. sugar beet, or 10lb. mangolds.

Individual feeding bails used for dry sows and boar.

Small, bare paddocks that become a sea of mud in winter are useless.

Feeding the Boar

Boars should be fed so as to keep them in good, healthy condition without being allowed to put on too much weight. Young boars that are still growing must be fed well to enable them to develop properly, and they should be used sparingly and with care.

Farrowing and Rearing of Litters

Sows should be put into their farrowing quarters at least a fortnight before they are due to farrow, so that they may have time to settle down. They should be fed well and provided with clean drinking water. For 24 hours before farrowing they should be fed very lightly, and for 24 hours after farrowing only drinking water should be given. It is advisable to provide a sow with bedding when she is put into her farrowing quarters. It is natural for a sow when due to farrow to make herself a nest and this instinct should not be thwarted. However, some sows will make a mess of any bedding they are given, and these are better without it. The farmer should know his sows' habits and act accordingly.

Because of shortage of labour it may be difficult to spare time to attend a sow at farrowing, but there is no doubt that it pays, because of the larger number of pigs reared. Feeding of sows while they are suckling should be on the basis of 4 food units daily for the sow's maintenance plus 2/3 unit for each pig in the litter. Some sows may need more.

Weaning and Mating Management

Careful attention at weaning time is very necessary if good breeding results are to be obtained. When the litter is 56 days old the sow should be taken away from the piglets and placed in a pen by herself and fed well. Normally she will come on heat 4 to 6 days after weaning, and she should be put to the boar 24 hours after that and again 24 hours later. When the period of heat is over the sow can be run with the rest of the dry stock, providing facilities exist to allow her to be fed so that she can regain condition quickly.

Breeding stock that is given free range on good pasture, provided with a warm, dry place to sleep, fed well and watched carefully by an owner who has acquired a good knowledge of the behaviour and habits of his stock will provide good litters of strong, healthy pigs and the foundation of profitable pig production. The care and expense entailed in acquiring good breeding stock should be exploited by good treatment of that stock.

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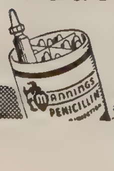

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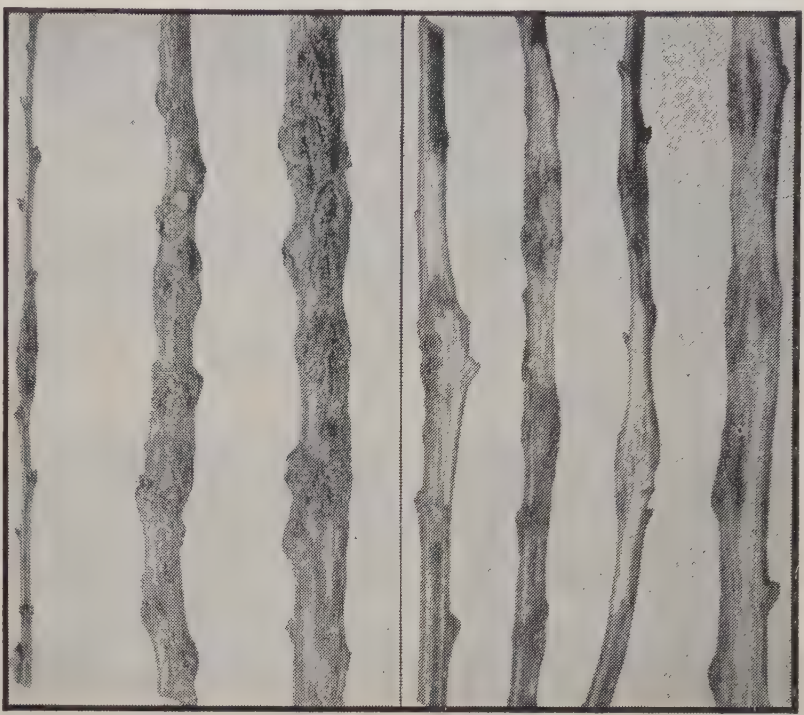
Identification and Control of Bacterial Spot of Stone Fruit

By H. S. TAYLOR, Horticultural Inspector,
Department of Agriculture, Auckland

INCREASING attention is being focused on the spread of fruit diseases. This article deals with bacterial spot of plum and peach (*Xanthomonas pruni* (Smith) Dowson), which has increased considerably in severity in New Zealand over the last few years. It is not new to New Zealand, having been reported over 20 years ago, but was then erroneously referred to as plum canker.



[Sparrow Industrial Pictures Ltd. photo.

Typical infection in young wood (left), and cross-section of young wood, showing depth of infection (right).

AT one time considered to be confined to comparatively few varieties, it has now increased its host range to a score or more varieties of Japanese plum. Although English varieties are generally highly resistant, isolated instances of infection have been recorded. Infection has also been found on several varieties of peach, but this is rare in New Zealand.

Of the varieties of plum attacked, George Wilson, Doris, Black Doris, and Masterpiece are most seriously affected. Unfortunately all of these varieties are popular and the commerical orchardist finds a ready demand for them.

Identification

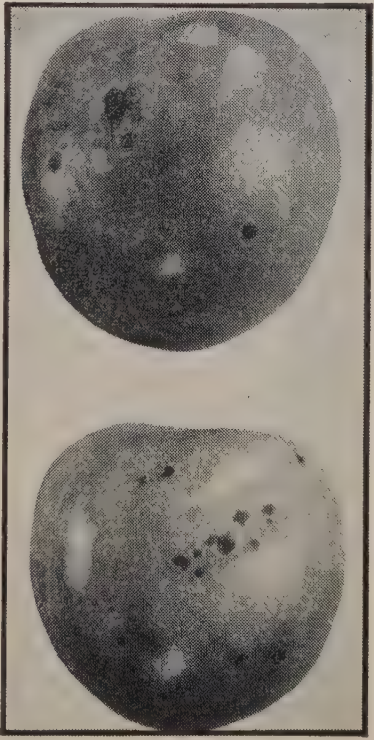
At first sight, the effects of the disease on the limb of a tree could be confused with a condition caused by the activity of the common cicada (*Cicadidae* sp.). In laying its eggs the insect inserts its ovipositor into the young wood of the tree. As the limb grows the injury tends to open and become more apparent and closer examination usually reveals a distinct herring-bone pattern. Distortion often takes place and at this stage the injury could be mistaken for bacterial spot. Infections of bacterial spot are similar in appearance, often becoming much larger and deeper, but without the regular pattern. When the injuries become serious in relation to the size of the limb affected, growth above the point of infection is usually stunted and weak.

The cicada does not spread the disease, but is one of the agents which injure the tree bark and allow the entry of the bacteria.

Infection is seldom found on the foliage. On the fruit it causes black, depressed spots up to ¼in. in diameter which make the fruit unattractive for sale. In advanced stages the depressions crack across the centre and become infected with soft rots, causing total loss of the fruit.

Young trees are often very badly infected with bacterial spot. It has the effect of stunting the growth of the tree and renders nursery stock useless for sale.

Continued high humidity is considered to contribute to the spread of the disease in young trees, as they grow close together in the nursery.



Infection on fruit.

Control Measures

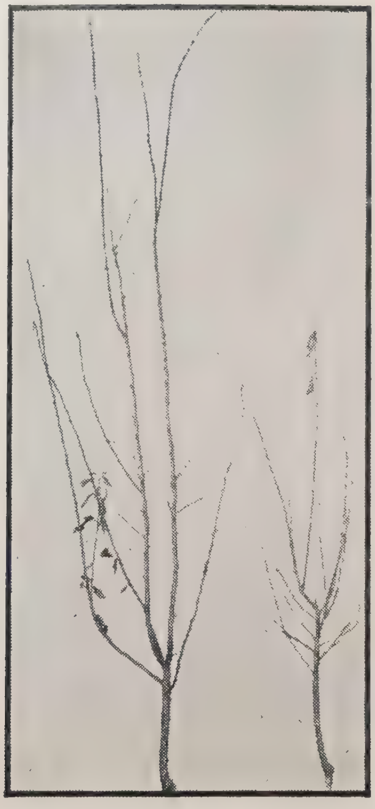
Of the many control measures tried experimentally, copper sulphate sprays have proved most effective and the following schedule is recommended by the Plant Diseases Division of the Department of Scientific and Industrial Research:—

	Bordeaux mixture
At bud movement ..	5 : 4 : 50
At petal fall	½ : 1 : 50
3 to 4 weeks later ..	½ : 1 : 50
3 to 4 weeks later ..	1½ : 3 : 50
3 to 4 weeks later ..	1½ : 3 : 50

Applied under normal conditions, the sprays will check the spread of the disease effectively and will keep infection from the fruit. Slight spray damage to foliage may be noticed after use of these sprays, but field observations indicate that the varieties of plums most seriously affected by the disease are least susceptible to injury by the recommended sprays. It has been found in field trials that the concentrations are most suitable under North Island climatic conditions. Further south sprays could be applied in slightly heavier concentrations without causing damage.

Attempts to control the disease by antibiotic substances such as penicillin have proved unsuccessful in field trials both in New Zealand and overseas.

The disease is water borne and infection can be carried by rain splash. It may also be spread throughout the orchard by use of cultivators, secateurs, etc. Attempts to eradicate it by heavy winter pruning are not recommended, field trials having proved that this will increase rather than decrease the degree of infection. Cutting out of infected branches in summer gives better results, but unfortunately coincides with the busy harvesting period in



[*Sparrow Industrial Pictures Ltd. photo.*

Comparative growth of healthy tree on left and infected tree on right. Both are 1 year old from the bud.

stone fruit orchards, when picking must necessarily be given preference. In orchards where bacterial spot cannot be controlled satisfactorily by spraying and such summer pruning as there is time for, consideration should be given to reducing the number of trees of the more susceptible varieties.

The most effective precaution against the introduction of the disease into the orchard lies in bud selection. Only budwood which has been carefully selected from disease-free trees should be used in propagation work.

When buying young trees the orchardist should reject any showing the slightest signs of infection.

Reference

"The New Zealand Journal of Science and Technology", Volume 31, No. 5, Section A, February 1950, pp. 40-43.

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CHANGES OF ADDRESS OF "JOURNAL" SUBSCRIBERS

To ensure continuity of delivery of issues of "The New Zealand Journal of Agriculture", subscribers are required to give 4 weeks' notice of change of address. The old address (preferably an address label clipped from a recent "Journal" envelope or wrapper) and the new address should be sent to the nearest office of the Department of Agriculture.

◆

Rural Field Cadetships Offered

ATTRACTIVE outdoor careers for boys interested in farming are opened up by the rural field cadetships offered annually by the Public Service Commission. The cadetships are awarded to applicants aged 17 to 19 who have shown interest and ability in farming and have good physique, appearance, and personality. Secondary education up to University Entrance Examination standard is required.

Boys from dairy farms should be able to put cows through a shed and have some knowledge of rearing of pigs and calves. Some experience of dagging and killing sheep, lambing, and working dogs is expected of applicants from sheep farms. Boys who live in towns but who spend farming holidays are encouraged to apply.

Training Programme

The 5-year training programme includes courses at Massey and Canterbury Agricultural Colleges, 1 year on a sheep station, 1 year on mixed cropping and fat-lamb-raising farms, 1 year on dairy farms, which includes pig husbandry, and about 4 months of fat-stock buying. At the conclusion of the course successful trainees are awarded the Diploma in Valuation and Farm Management from Canterbury Agricultural College.

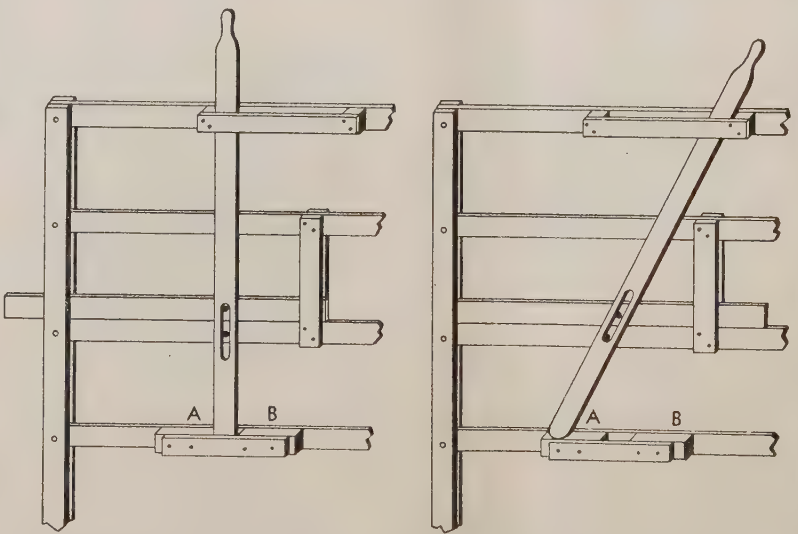
During training cadets receive award wages when working on farms and get 2 weeks' annual holidays on Public Service salaries. Cadets while at Massey and Canterbury Agricultural Colleges have their tuition fees and boarding expenses paid and receive a subsistence allowance. Cadets are eligible to join the Public Service superannuation scheme.

On graduation cadets are employed in work connected with farm management and valuation as instructors in agriculture (if assigned to the Department of Agriculture), field supervisors (Maori Affairs Department), field officers (Department of Lands and Survey), farm appraisers (State Advances Corporation), or valuers (Valuation Department). They have excellent prospects of attaining salaries of £800 or more early in their 30's.

Full details of the scheme may be obtained from careers masters at schools, the Public Service Commission, Wellington, or the Rural Field Cadet Scheme Supervisor, State Advances Corporation, Wellington.

Simple and Effective Gate Fastener

ON many farms and stations an odd animal, particularly a horse or pony, often develops the mischievous habit of playing with gate fasteners until they become unlatched, with the result that stock become "boxed" and much annoyance and inconvenience are caused.



The sketches show a gate fastener which is not only proof against a wily animal, but which a horseman can lock and unlock without dismounting.

The key to the success of this fastener is the slotted handle. The slot should be about ⅛in. or 3/16in. wider than the diameter of the bolts used and a little longer than the combined depth of the gate bar and sliding bar. Use a large flat washer between the nut of the bolt and the handle. A cover bar can be fitted on the outside of blocks A and B; this will prevent an animal getting its nose under the end of the handle and lifting it.

To unlock the gate lift the handle and pull it back; the bottom end of the handle slides along block A. To lock the gate push the handle forward and allow the handle to drop between blocks A and B.

—*K. M. MONTGOMERY, Fields Instructor,*
Department of Agriculture, Te Kuiti

Treatment of Newly Bought Pullets for the Household Poultry Flock

WITH the laying shed finished, litter on the floor, and water in the drinking trough, the household poultry keeper who has been following this series of articles by the Animal Industry Division will be ready for the arrival of the pullets. This article discusses what should be done when the pullets arrive and the types of food needed during their laying year. Though the breeding of a pullet influences appreciably the number of eggs laid during the year, management and feeding have an equal if not greater influence on production and the health of the bird. Next month's article will deal with feeding methods and the quantities of food needed.

If the birds are considered of sufficient standard to warrant their acceptance, the first essential is to give them food and water.

IF BIRDS are fetched directly from a farm, the buyer can satisfy himself about their quality and health before he takes them away. That he cannot do if he does not see the birds until they arrive by road or rail. Such birds may have travelled for some hours without food and water (though for long distances birds should be provided with them in their travelling crate), so the first essential is to see that they receive food and water.

However, the wise householder does not put the birds in the clean laying shed without first examining them carefully for health and condition. If he is not satisfied with the birds, he should feed and water them and then make immediate arrangements to return them to the vender. This may save endless and fruitless arguments by letter later. If the birds are retained for a few days, the householder may be told that colds or poor condition in the birds are faults contracted after arrival because of poor management or feeding by the householder.

When they arrive the pullets should be free from sticky and running nostrils denoting colds, in good body condition and of good weight for size, even in size, bright of eye, and active. Unfortunately it is difficult to lay down approximate sizes of birds according to age and breed, this being a point requiring knowledge based on experience. Backward pullets usually are birds which have received a check, and no amount of good management will entirely counteract the damage done by a check. However, such birds kept in small units of up to a dozen have a better chance of recovery than do birds run in a large flock where competition is greater.

Reminders for June

Laying birds should not be coddled, even during cold winter weather. They need adequate ventilation without direct draughts. A stuffy laying house in winter is likely to induce colds.

Rats find food scarce at this time of the year and become emboldened in their forays after poultry food. Watch for their appearance around poultry housing and destroy them before they become established.

Laying birds need adequate protein in their diet during winter to stimulate egg production, and the inclusion of 15 per cent. of meat meal in the laying mash is desirable at this time. If No. 1 standard laying mash containing 10 per cent. of meat meal is fed, keep a small trough of meat meal before the birds all the time.

Before the new owner decides to accept newly arrived pullets he should examine each bird for parasites and defects of health and physique. Infested birds may be treated as described on this page, but those physically unsatisfactory should be given food and water and returned immediately.

Treatment for Parasites

If the new owner is satisfied with the quality of the pullets, they may be put into their new quarters, but two precautions are worth serious consideration: Pullets may well be carrying lice on their bodies and roundworms in their intestines, and both can be eliminated at this early stage readily and with outstanding benefit to the birds.

Each bird should be inspected under the fluffy feathering covering the abdomen around the vent. If small brown lice are seen running over the skin, or if nits (lice eggs) are attached to the bases of some of the feathers, treatment should be carried out without delay by painting the perches with a strip of nicotine sulphate about ¾in. wide 20 to 30 minutes before the pullets go to roost. If this treatment is repeated after 14 days, the birds will be freed from lice.

The presence of roundworms can rarely be determined without a post-mortem examination, but as newly bought pullets may be harbouring some of these parasites, which if left unchecked will multiply, dosing them is a wise precaution. Capsules containing carbon tetrachloride are used, birds 4 months old or younger being given 1 c.c. and older birds 2 c.c.; capsules of either size can be bought. Dosing pullets with carbon tetrachloride before they come into production should be regarded as part of routine management to control disease.

Foods Required

Four kinds of food are required by laying birds in a household poultry flock—grain, laying mash, greenfeed, and grit.

Grain

In general the household poultry keeper should aim to use a good grain mixture containing wheat, oats, and barley, with kibbled maize replacing barley during winter. Grain may be bought already mixed, but care must be taken to ensure that the grains are of reasonable quality. Oats should be plump, not just a thin husk with little kernel, and wheat and barley should not be shrivelled and lacking in body.

If the householder wishes to make his own mixture, 3 parts of wheat, 2 parts of barley or kibbled maize, and 1 part of oats by weight may be used.

Wheat alone may be used satisfactorily, but sufficient may not always be available.

Mash

Bran and pollard alone are not available for feeding to poultry at present and all poultry keepers must buy ready-mixed laying mashes. Standard laying mashes are now made and distributed throughout the Dominion at the request of the poultry industry and not by Government order, as they were during the war and immediately afterward. Insufficient pollard and bran are available to satisfy all demands for stock feeding, and poultry producers, both large- and small-scale, have been found to receive a more equitable supply of these two important meals when their distribution is controlled by including them in poultry mashes mixed to formulas agreed on by the New Zealand Poultry Board.

For household poultry keepers two laying mashes are available from retailers—No. 1 and No. 2 standard laying mash, the first containing 10 per cent. of meat meal and the second none. For all practical purposes No. 1 laying mash is complete, whereas No. 2 contains insufficient protein for either growing or laying birds. For pullets younger than the laying age it is unnecessary and may be undesirable to feed a full 10 per cent. of meat meal, so No. 2 laying mash should be fed with 5 per cent. of meat meal added (½lb. to 10lb.) until the birds are about 18 weeks old, when this amount may be increased to 7 per cent. (¾lb. to 10lb.). As soon as the pullets start to lay No. 1 laying mash should be fed to provide the birds with a full 10 per cent. of meat meal.

Greenfeed

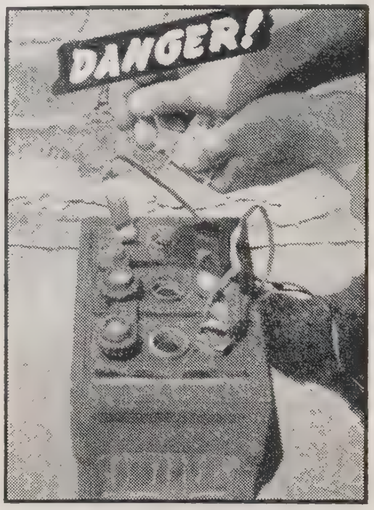
Vitamin A is essential for laying birds, both for egg production and for health. Succulent greenfeed is a source of vitamin A and for this reason is a desirable food for laying pullets, an adequate ration being about ½oz. per bird per day. It is most important to use young, succulent greenfeed and not rank, old herbage that contains excessive fibrous material and has become deficient in vitamin A. Silver beet, fresh young grass clippings, chou moellier, kale, lettuce, and cabbage are good forms of greenfeed for poultry and can be grown readily in a home garden.

Next month's article will explain the use of fish oils as a means of ensuring adequate vitamin A in the diet of poultry when greenfeed is not available or is poor in quality.

Grit

Laying birds require two forms of grit for different purposes: They need a grit rich in lime, such as oyster shell and pipi shell, laying birds requiring lime in addition to that in the mash to ensure an adequate amount for use in forming shells of eggs; and they need a hard metal grit which lodges in their gizzards and is used there for grinding up food eaten. Supplies of both shell grit and hard metal grit should be always available to the birds in small troughs or boxes, replenished as their contents are depleted.

Photographs by Fraser Niederer.



WHEN batteries are being charged a very inflammable gas is produced, and use of a naked light to inspect the level of electrolyte in the battery is likely to cause an explosion. Where a light is necessary use an electric torch. Similarly, the connecting or disconnecting of batteries while the generator or charger is running can also cause sparking, which may ignite escaping gas. The generator or charger should be stopped.

Neglect of these precautions has been the cause of damage to eyesight, not only from the explosion, but also from acid blown from the battery.

—D. F. SCOTT, Farm Machinery Instructor, Department of Agriculture, Auckland

Preparing Land for Mole Drainage

TO be successful mole drainage requires a good, even paddock surface. The crossing of deep finishes and high strikeouts with a mole plough may mean ruin to the system and consequently the loss of time and money expended. The mole channel requires a continuous fall, the only variation permissible being an increase toward the outlet.

AS the mole plough follows to a great extent the surface of the ground, it is necessary for the ground surface along the line of the mole channel to have a continuous fall. Crossing depressions and strikeouts results in a loss of fall in the mole channel, water lying in such spots, and a rapid breakdown of the system.

The flatter the land the more important this point of even surface becomes. With a good fall a few liberties can be taken, such as crossing finishes and similar irregularities, but where fall is at a minimum the ground surface must be free from such local variations.

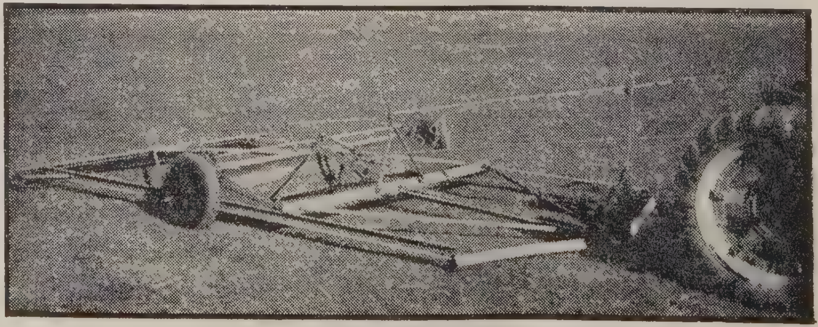
It is sometimes possible to run moles parallel to the ploughing and so avoid crossing finishes, but this may necessitate so modifying the system as to reduce its efficiency.

A good surface can generally be obtained by the intelligent use of the normal farm implements, but where a lot of soil has to be shifted special levelling equipment may have to be used.

Types of levellers are available which are simple and easily operated and which can do much to produce the required even surface.

This article emphasises one point with regard to mole drainage—that planning for the future is essential. When a paddock is being worked before it is sown down the possibility of mole draining in the future should be considered and the surface levelled with that aim in view.

—J. F. SCOTT,
Drainage Instructor, Department of Agriculture, Christchurch



This type of leveller has been used extensively for irrigation work and has proved very satisfactory.

Cherry Culture near Christchurch

THE valleys of the Port Hills and Governor's Bay are very suitable for the growing of stone fruits, as they have well-drained and fertile soils, are relatively free from damaging frosts, and are close to the city markets of Christchurch. There are several large cherry orchards in the district, but increased plantings are limited by high labour costs, the expense of erecting bird-proof enclosures, and the susceptibility of cherries to some prevalent diseases. This article by M. G. Baumgart, Horticultural Instructor, Department of Agriculture, Christchurch, describes the varieties of cherries grown, the diseases and pests they are most susceptible to, and the measures necessary to control them.

THERE are in the area approximately 27,500 stone-fruit trees, 3500 of which are cherries; about 90 per cent. of these are in the Heathcote, Horotane, and Governor's Bay districts.

The Heathcote and Horotane Valleys on the northern side of the Port Hills face the sunshine and are sheltered from the cold east, south, and south-west winds. The soil is rich and well drained and the slopes of the valleys are sufficient to provide air drainage and relative freedom from late frosts. Governor's Bay, at the head of Lyttelton Harbour, though perhaps not quite as well situated, has also proved suitable for cherry growing.

Production from mature cherry trees in the Hills and Governor's Bay areas varies with varieties, but well-cared-for trees will each produce approximately 70lb. of marketable fruit; those grown on the plains, however, produce between 40 and 50lb. of fruit, more loss being suffered from late frosts.

History

Commercial plantings of cherries were made in Governor's Bay and Heathcote between 1870 and 1880. A few of these trees are still growing and producing good crops. Most of the orchards in production today were planted between 1910 and 1925.

[*V. C. Browne photo.*

The Heathcote (left) and Horotane Valleys, where a large proportion of the cherries grown near Christchurch is produced.

A heavy snowstorm in 1945 broke down most of the cherry enclosures and severely damaged a large proportion of the trees. Several of the orchards were so extensively damaged that they have been pulled out, while others have lost a large number of trees through being infected with silver leaf (*Stereum purpureum*), which entered through the wounds.

The Hills area and Governor's Bay are within easy reach of the City of Christchurch and most of the cherries are sold locally. Quite a large quantity of Central Otago cherries is also sold at Christchurch, but the locally grown fruit matures about 2 weeks earlier than similar varieties from Central Otago and so does not clash with that from the south. Over the years it has been found by local growers that Christchurch markets give a return at least equal to that of North Island cities.

Stocks

The early plantings were almost entirely of Australian trees which were on Mazzard stock. This stock is still considered the most suitable, although Mahaleb and Wild Guigne have also been used. Both Mahaleb and Wild Guigne give smaller trees, which also seem more susceptible to disease.

Varieties

Sweet cherries are self sterile, but as most orchards contain a number of varieties, pollination troubles are not common.

Varieties grown today with few exceptions, are identical with those first introduced, the few changes which have occurred being mainly a result of the susceptibility of certain types to disease. One variety which was popular and which became subject to gummosis and die-back was Early Purple Guigne. Originally this was the main early variety.

The most popular varieties today are:—

Early Rivers: This has become the most popular early cherry. It crops regularly, and the fruit is large, dark red, of good quality, and resistant to cracking. The trees are vigorous, of weeping habit, but rather subject to gummosis.

Early Lyons (Bigarreau Jaboulay): Another early variety of very good quality, but liable to produce a large percentage of misshapen, unmarketable fruit. Another disadvantage is that it is very liable to cracking; even a heavy dew may cause a severe loss.

[*Green and Hahn Photography Ltd. photo.*

A well-built timber cherry enclosure in the Port Hills area.

[Green and Hahn Photography Ltd. photo.

Interior view of the enclosure shown on page 381.

The fruit is bright red, of good size, and excellent quality. The tree is similar in habit to Early Rivers.

Bedford Prolific, Doncaster, and Black Bohemian: These are similar mid-season varieties which are suitable for this district. They become large, upright trees which bear heavy crops of very good-quality, medium-sized, dark-red fruit, and appear resistant to gumming, cracking, and brown rot.

Bing: This variety bears heavily and the fruit is very large, deep red, and of excellent quality. The tree is of a weeping habit and does not grow as large as Bedford Prolific. It comes in immediately following Bedford Prolific, but is more subject to cracking.

Black St. Margaret: There are at least two strains of this variety in the district, one of which is of Australian origin and is not up to the standard of the strain propagated locally. The fruit is large and black, of excellent quality, but rather susceptible to cracking. The tree is rather small and stunted in appearance.

Florence: This is a good-quality late cherry, the flesh being white with a red, mottled skin. The tree is quite vigorous and of spreading habit. White cherries are not as popular as the red varieties.

Cultural Practices

Trees are usually planted 20ft. apart each way where spreading varieties are included. Where only upright varieties are planted 16ft. apart is sufficient.

Pruning

During the early years of growth pruning consists of shaping the trees, but as they mature the only cutting done is summer pruning of shoots which are growing through the netting and the removal of dead, diseased, or overcrowded wood.

Manuring

Mature trees are given a basic dressing of blood and bone, up to 10lb. per tree being applied. A spring application of potash and sulphate of ammonia is sometimes used. The lime content of the soil in the valleys of the Port Hills is extremely high, and liming is not necessary and may cause mineral deficiencies. In some orchards green crops such as lupins, barley, and subterranean clover are sown in late summer, and worked into the soil in spring.

Spraying

A 5 per cent. winter oil spray is used for the control of scale insects and aphis eggs, and after the fruit is picked arsenate of lead at 1½lb. per 100 gallons is used for the control of cherry slug. Nicotine sulphate applied at a strength of 1 : 800 near Christmas also has given good control of both aphides and cherry slug.

Fruit is picked into tins which will hold approximately 10lb. It is then hand sorted, damaged fruit and leaves being removed, and jumble packed in 10lb. flat cases. At one time the top layer was sometimes "faced" (that is, with no stems showing when the lid is removed) to improve the appearance of the case, but latterly this practice has ceased and fruit is jumble packed. In order to "face" a case the bottom layer is placed in the case with all stems upward; then the case is filled and lidded and turned upside down before being labelled.

Principal Diseases and Pests

The principal diseases and pests are as follows:—

Silver leaf (*Stereum purpureum* Pers. ex Fries): This fungous disease has caused a considerable loss of trees, particularly since the snowfall of 1945. A large proportion of the trees which were broken by the snow became infected and have since died. To control the disease infected branches should be removed as soon as they are noticed by cutting well below the visible infection and immediately sealing the wound with a suitable dressing such as lead paint, bituminous paint, or green crude petroleum.

Where severe infection occurs removal of the whole tree is necessary.

Gummosis: This appears to be a physiological disorder, causing the decline and death of limbs of trees and in severe cases whole trees; the cause is unknown.

Scale insects: Cherries are particularly susceptible to San Jose scale, which suck the sap. This is readily controlled by a 5 per cent. winter oil spray in the dormant period.

Aphides: These insects suck the sap of leaves and young shoots, causing distortion. The eggs are readily controlled by winter oil, the same spray which controls the scale insects. The adults may be controlled by spraying with nicotine sulphate after the fruit has been harvested.

Cherry slug (*Caliroa limacina* Retz): This insect chews away the green tissue of the leaf. It is readily controlled by the application of an arsenate of lead spray after the fruit has been picked.

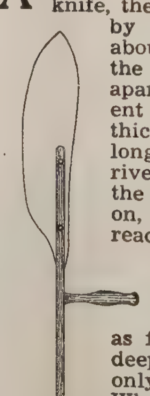
Brown rot (*Sclerotinia fructicola* Schroeter): This disease normally causes little loss, except in humid seasons, and no control is normally practised. However, after a season when the disease has been severe Bordeaux mixture is used at bud movement.

Birds may cause considerable damage to the ripening fruit unless some protection is provided, and in this district it is necessary to erect bird-proof enclosures, as the use of explosive bird scarers and firearms in built-up areas is prohibited.

Prospects of Increased Plantings

With the present high labour costs, the expense of erecting bird-proof enclosures, and the prevalence of silver leaf and gummosis it is not likely that plantings of cherries will increase greatly in the near future.

Hay Knife Adapted for Trimming Drains



AN adaptation of an ordinary hay knife, the tool illustrated is made by boring two ½in. holes about 1in. from the back of the knife and about 1ft. apart. A handle of sufficient strength, convenient thickness, and about 5ft. long is then bolted or riveted on to the blade. If the long handle is bolted on, it can be removed readily if necessary.

For side cutting shallow drains both handles can be utilised as for cutting hay, and for deep drains the long handle only is used, still vertically. When kept really sharp this tool is very efficient. It eliminates the necessity for getting into drains and so avoids the unpleasant splashing associated with trimming the sides of a drain with a slasher or similar tool.

—*J. G. MITCHELL,*
Fields Instructor,
Department of Agriculture,
Taumarunui

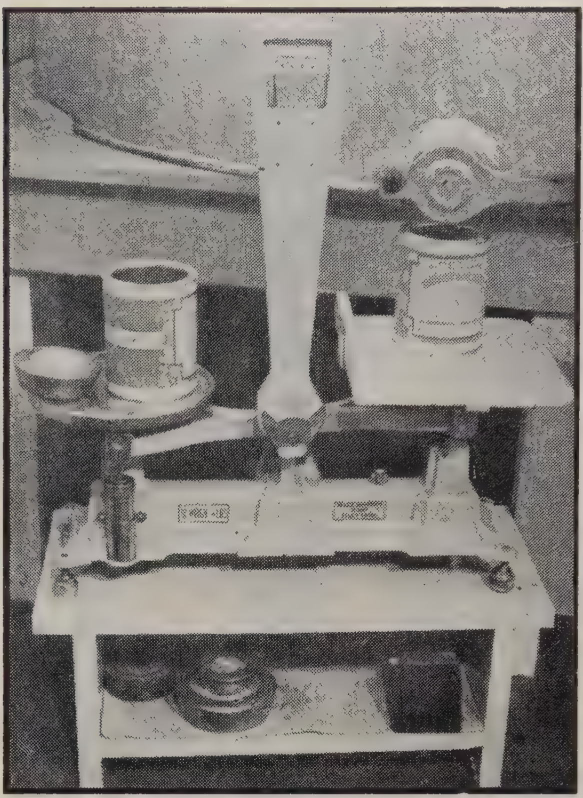
Weighing and Labelling of Honey

MANY beekeepers in presenting their honey for sale are not complying with the provisions of the Food and Drug Regulations 1946 affecting their product. The requirements in weighing, packing, and labelling are not onerous, and those failing to meet them are prejudicing their product and the industry without reaping a commensurate private advantage. In this article C. R. Paterson, Apiculturist, Department of Agriculture, Hamilton, indicates the correct methods of preparing honey for sale.

THE final stage in the production of honey has been reached when it is ready to be filled into retail containers. These containers will cover a range of glass jars, waxed paper cartons or pottles, and tins of various sizes.

Weighing Honey

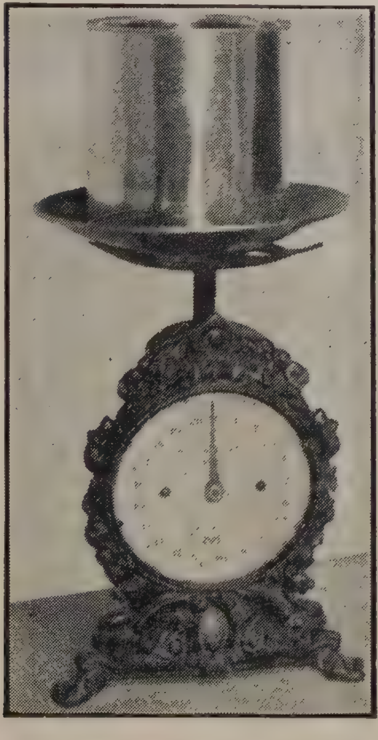
No matter what type of container is being used some means has to be employed to make sure it is filled with the required amount of honey. Customers are entitled to receive the amount of honey for which they pay. Haphazard methods, such as filling up to a certain mark on the container, are very unreliable and most often result in an over-weight pack, because the vender makes sure his product is not under weight. This is a direct gain to the purchaser, but over the years it could prove a considerable financial loss to the beekeeper. It takes a very small volume of honey to weigh an ounce. If the beekeeper is filling up 1lb. containers and through bad weighing gives away on the average ½oz. per container, he is robbing himself of 70lb. of honey per ton or £80 on a 20-ton crop. In the past much profit must have been given away in this manner by many beekeepers.



Correct type of scales. Similar scales of more modern design are available.

Suitable Scales for Small Containers

Though large platform scales used when filling 60lb. tins can be used for small containers, they are not recommended because of possible error when weighing such small quantities Beekeepers should always remember that short weight in honey containers of any size is an offence. To be safe it is much better, therefore, to use a smaller and more suitable type of scales. These are, unfortunately, fairly expensive, but perhaps not as expensive as being convicted of selling honey which is short of stated weight.



This type of scales has never been permitted for weighing honey.

Types of scales that can be used and those that are not permitted are illustrated on this page. Information about scales can be obtained from the nearest inspector of weights and measures of the Labour and Employment Department.

Labelling

The public would have very little confidence in purchasing a container of honey if it did not have a label or some printed matter to indicate the contents and who was responsible for packing it. Attractively designed labels not only give this information but draw attention to the particular article.

Labelling Requirements

The correct labelling of foods is supervised by the Health Department. Four items must appear on any label if it is to comply with the regulations. They are:—

1. The contents of the package.
2. The name of the producer or packer.
3. Full address of the producer or packer.
4. The net weight of contents.

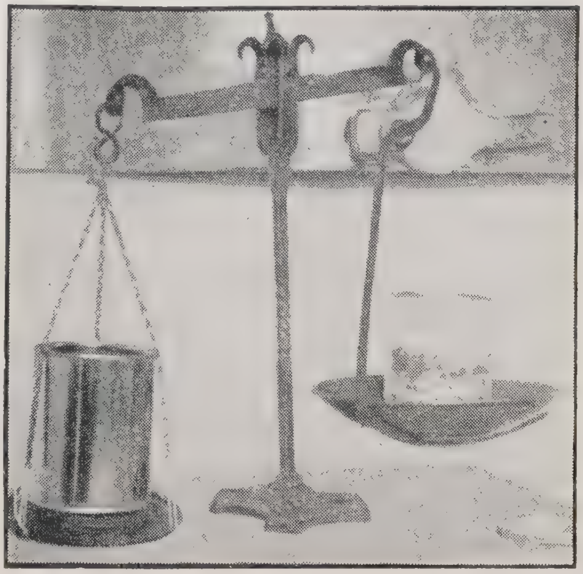
Permissible packs under 1lb. are 1oz., 2oz., 4oz., 6oz., 8oz., or 12oz. Net weight of such packs must be shown on the label in ounces. Other permissible packs are 1lb., 1½lb., and any multiples of 1lb. net.

These details must be in block lettering, the minimum type size being 6 points (1/12in.), the smallest type shown on the reduced-size label illustrated below. Details on the label could be expanded to indicate the type of honey—clover, manuka, medium- or mild-flavoured, or creamed clover.

HONEY
Produced and Packed by
A. B. Smith
9 Boundary Rd., Napier
5lb. net

Any one of these names would indicate to the purchaser the kind of honey that was being purchased. An indication as to the type of honey is recommended, but beekeepers when using such labels should be most careful to see that the contents are true to label. A container labelled clover honey should contain clover honey. If it is not possible to indicate a definite source with any degree of accuracy.

the beekeeper should simply define the contents as honey. The word "pure" is superfluous. Definition of honey in the Sale of Food and Drug Regulations is clear: "Honey shall be the nectar and saccharine exudations of plants gathered, modified, and stored by the honey bee; it shall contain not more than 20 parts per centum of water, and not less than 60 parts per centum of reducing sugars, and it shall not yield more than three-fourths of one part per centum of ash. It shall not contain added sugar or glucose, or artificial sweetening substance, or any other added substance."



Obsolete type of scales, which cannot be used now.

Any product not complying with this description cannot be labelled and sold as honey.

Beekeepers who do not have sufficient honey to justify the printing of a label may use a rubber stamp, provided the required information is given. To make sure that the information remains legible a waterproof, opaque, quick-drying stain ink must be used. This ink can be procured from most stationery shops. The use of ordinary rubber-stamp ink is not permitted.

Registration of Label or Trade Mark

Frequently inquiries are received from beekeepers about the registration of their particular label as a trade name. For the beekeeper in a small way there appears to be very little to be gained by such a procedure. A large producer who has designed a particularly attractive label may wish to retain the right to use such a label by registering it. This prevents any other person from using a similar trade name or design. Beekeepers seeking information on this subject should communicate with the Commissioner, Patent and Copyright Office, 81-85 Lambton Quay, Wellington.

Summary of Obligations

When packing honey for local sale the beekeeper has certain obligations. They are:—

1. That the honey conforms to the standards set in the Sale of Food and Drug Regulations.
2. That the container is labelled correctly.
3. That the contents are true to label.
4. That the weight indicated on the label is correct.

A product that is well packed and correctly labelled will always gain the confidence of purchasers and retailers.

Manuring of Market Garden Crops

A COMPREHENSIVE trial to investigate the manuring of a number of market garden crops was begun at the Rukuhia Soil Research Station in the spring of 1949 and will continue for at least 9 years. The soil type used, the Hamilton clay loam, is typical of the market garden soils in the district. The trial is on a northerly slope of an average gradient of 1 in 10. This aspect and grade favour good winter and spring growth and natural drainage, and suitable cultivation prevents damage by erosion on this soil type.

A STANDARD 3-year rotation is followed and is repeated in various sections of the trial so that all crops of the rotation are grown each year on some part of the experimental area. The rotation is: First year, potatoes and winter cabbage; second year, french beans and spring cabbage; third year, silver beet and lupins for green manure. Apart from a lupin crop, the only crop residues incorporated with the soil have been an unfertilised catch crop of barley grown during the winter between the first and second year of the rotation. Manurial treatments are superphosphate at 3 and 10cwt. per acre and bonedust at rates to give equivalent phosphate dressings to these. Nitrogenous fertilisers are represented by nitrate of soda at 1 and 5cwt. per acre and dried blood applied at rates to give equivalent nitrogen dressings to those supplied by the nitrate of soda. The first two seasons were dry and with mild winters.

Rate of Phosphate

For the first 2 years of the trial the most important findings have been the greater response of cabbages and potatoes to the heavy (10cwt.) phosphate dressing than to the ligher (3cwt.) application. Potatoes receiving 3cwt. of phosphate yielded slightly more than 10 tons per acre, but those dressed with 10cwt. of phosphate yielded 18 per cent. more, or nearly 12 tons per acre. The extra yield with cabbages was generally most marked in the first picking, when the heavier phosphate dressing gave increase in yields of up to 38 per cent. above the 3cwt. dressing. The extra yields to heavy phosphate were not significant with silver beet or french beans.

Form of Phosphate

Superphosphate gave considerably better yields than bonedust with the first crop of french beans, but not in the second crop. On the other hand with spring cabbage, although greater yields were secured from superphosphate than from bonedust with the first picking, there were significantly lower yields from superphosphate in the second and third harvests of cabbage. With the other crops there were no significant differences in yield between the superphosphate and bonedust treatments.

Effect of Nitrogen

In no case was there any definite increase in yields from the use of 5cwt. of nitrogenous fertiliser instead of 1cwt. per acre. Neither was there any significant difference between dried blood and nitrate of soda as sources of nitrogen.

—*H. A. BROWNING, Research Officer, Department of Agriculture Rukuhia Soil Research Station, Hamilton, and P. B. LYNCH, Crop Experimentalist, Department of Agriculture, Wellington*

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BOOK REVIEW

"Dairyfarming Annual 1951"

THE addresses and discussions of the 1951 meeting of dairy farmers at Massey Agricultural College are fully dealt with in the Dairyfarming Annual 1951. The book is up to date on such subjects as spray irrigation, the use of hormones in the control of weeds, testing and servicing of milking machines, and rationed grazing, and deals extensively with other general farming topics. The discussions following the papers are in many respects as interesting as the main addresses, and the book illustrates well the value of the exchange of information at the discussion periods and the open forum session.

Massey Agricultural College, Palmerston North. 15s.

Publications Received

"Farmer & Stock-Breeder Year Book 1952", 76th Edition, Farmer and Stock-Breeder Publications Ltd., Dorset House Stamford St., London SE1. 10s. 6d.

"Sheepfarming Annual 1951", Massey Agricultural College, New Zealand. 15s.

Cauliflower Culture

THE cauliflower (*Brassica oleracea* var. *botrytis*) is a biennial plant which has been perfected by long cultivation and selection from the wild or sea cabbage (*Brassica oleracea*) found near the coastal regions of England and southern Europe. The sprouting broccoli represents the first form of cauliflower selected. After this successive improvements produced a compact, white-headed variety, the modern cauliflower. Production of cauliflower, though not a highly specialised undertaking, is more difficult than that of cabbage or broccoli and requires careful planning. Consideration must be given to provision of favourable conditions for the production of good-quality heads, and facilities for distribution and supply to markets must not be overlooked. Furthermore, full advantage must be taken of the seasonal adaptability of certain varieties and types proved by experience to be most suitable for the particular climatic and soil conditions.

Harvesting cauliflowers in an Auckland market garden.

IN this article, S. O. Gillard, Vegetable Instructor, Department of Agriculture, Auckland, describes the practices followed in the growing of cauliflowers for commercial purposes in the Auckland district, where this vegetable is harvested from April till December.

Climate and Soil

Cauliflowers flourish where the climate is moderately cool and a good, uniform supply of soil moisture is maintained. They must not receive a check at any time during the growing period. The plants may fail to form good-quality heads if the weather is dry and hot when the crop is maturing. Hard frosts or low soil and air temperatures may retard growth early in the season, causing the heads to develop prematurely and to be small. Poor strains of seed are also frequent causes of failure. Any of these unfavourable conditions may induce "ricy" or "fuzzy" curds. A leafy curd (small leaves growing between the segments of the curd) is common when conditions are unfavourable.

Cauliflowers can be grown on a wide range of soils, but the ideal is a deep loam overlying a well-drained subsoil. The plants must have an adequate supply of moisture during the growing season, but an excessive amount due to bad drainage is harmful. Poorly drained soils tend to be acid, a condition that predisposes the plants to attacks by club root and root rots.

The climate in the Auckland district is particularly suitable for the growing of cauliflowers and by successive plantings, extending from January to August, good supplies of this vegetable are maintained from April to December. The main centres of production adjacent to Auckland are Mangere, Otahuhu, Panmure, and Avondale; they are grown also at Pukekohe, 30 miles south of the city.

Each year commercial growers who operate within a radius of 30 miles from Auckland plant approximately 600 acres of cauliflower and produce an average of 10 tons per acre.

A common cycle of crop rotation is: Cauliflower followed by tomatoes or potatoes and then by carrots or similar roots before cauliflowers are planted again. Though it is not always possible to follow an ideal programme, growers should endeavour to avoid successive crops of the same family; in other words, cabbages, brussels sprouts, turnips, etc., are unsuitable for rotation with cauliflowers. The risk of building up soil diseases peculiar to one type of crop is greatly reduced by well-planned crop rotation, which also permits the best use to be made of the available soil fertility.

Varieties

Most varieties of cauliflower can be grown in the Auckland districts, but several have proved specially suited to local conditions. Cauliflower varieties can be classified into two types, summer and winter. The tender, summer varieties mature more quickly, but are more exacting in regard to soil fertility and soil moisture. Generally winter cauliflowers have leaves which embrace the curd and fold over to protect the heads from frost and weather damage, while summer varieties have more upright leaves.

The following list of varieties suitable for the Auckland district is given as a guide; periods of maturity will be influenced to some extent by location, soil, and other factors (W = winter cauliflowers—hardy in most localities; S = summer cauliflowers; X = hardy only in warm localities):—

Phenomenal is the most popular variety with commercial growers in the Auckland district, but Roscoff, a popular variety in England, is rapidly coming into favour.

Conditions Favourable to Success

Though late (winter) cauliflowers can be grown in most localities, the early-maturing (summer) cauliflowers can be produced successfully only where severe or sustained frosts are rare and the soil is warm.

Seed

Inferior strains of cauliflower seed are expensive, because they may produce poor heads even under the most favourable conditions. Cauliflower seed of merit is difficult to produce and consequently is dear, but it is better to pay the high price than to risk failure of the crop.

Seed Production

Many growers save their own seed from selected heads. Before curds begin to elongate plants are carefully removed with good balls of soil attached and planted in a nursery bed, or an area is planted specially for seed and the plants are rogued (all inferior ones removed) as they mature.

In saving cauliflower seed there is always danger of cross-pollination by insects at flowering time if stock plants are grown close to other flowering brassicas; it is therefore always

Varieties	Sowing period	Planting-out period	Harvesting period	Per cent. of plantings in district
SX—Early London	Nov.	Jan.–Feb.	April–May	20
SX—Phenomenal Early	Nov.	Jan.–Feb.	May–June	
S—Roscoff No. 2	Nov.	Jan.–Feb.	May–June	
W—Phenomenal (5 months)	Nov.	Jan.–Feb.	June–July	
W—Roscoff No. 3	Nov.	Jan.–Feb.	June–July	
W—Phenomenal (5 months)	Jan.	March–May	Aug.–Sept.	70
W—Roscoff No. 3	Jan.	March–May	Aug.–Sept.	
W—Phenomenal (6 months)	Jan.	March–May	Sept.–Oct.	
W—Roscoff No. 4	Jan.	March–May	Sept.–Oct.	
SX—Phenomenal Early	May–June	Aug.–Sept.	Nov.–Dec.	10
S—Roscoff No. 2	May–June	Aug.–Sept.	Nov.–Dec.	

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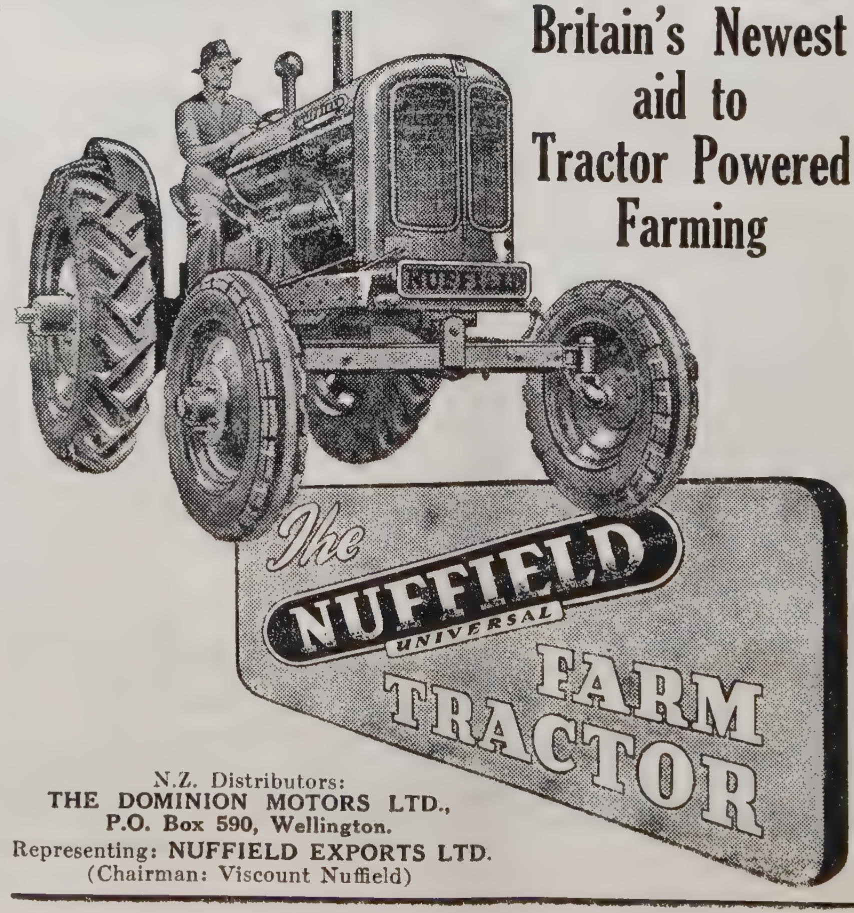

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advisable to test each crop of seed for purity before planting out a large area with it.

For seed crops, irrigation in furrows is preferred to overhead sprinkling, which aids spread of disease. When the heads are fully formed it is advisable to cut out a fairly wide cross-section in the head. This loosens the curd, allows rain-water to drain away, and reduces the danger of rot. A Bordeaux spray at a strength of 3 : 4 : 50 should be applied immediately after the sections of the curd are removed. If soft rot becomes prevalent later, particularly during sultry weather, another application of the spray is necessary.

As soon as a good portion of the seed pods have turned yellow the plants should be cut near the ground. If they are cut in early morning, the loss from shattering is reduced. The stalks can be placed on raised canvas or cotton sheets to dry. It is an easy crop to thresh, and to save damaging the seed it is best threshed with a piece of light rubber hose on a canvas-covered floor. After cleaning, the seed should be stored in a cool, dry place. A good yield is 100 to 150lb. of seed per acre.

Production of Seedlings

Well-drained beds sheltered from cold winds are desirable for the production of seedlings during the colder months of the year. However, it is inadvisable to provide more than sufficient shelter and during the warm months little or no shelter is required. Thoroughly prepared beds raised about 4 to 6in. above the surrounding ground level to assist soil aeration and drainage are best. The seed-bed area should be well limed some time previous to sowing; average Auckland district soils will require about ½lb. of carbonate of lime to a square yard.

A few days before seeding a fertiliser dressing composed of a mixture of equal parts of dried blood and "super. compound" plus 1lb. of sulphate of potash to each 20lb. of mixture should be applied at the rate of 4oz. a square yard.

Seed sown ½ to ¾in. deep in drills 9 to 12in. apart, with about 30 to 40 seeds per foot of drill, should produce evenly grown seedlings which can be weeded and sprayed conveniently. Broadcasting of seed in beds is not recommended, as crowding of the plants favours infection with fungous diseases, especially downy mildew.

Cauliflower seedlings are very susceptible to mildew infection, and applications of Bordeaux 3 : 4 : 50 are generally necessary at 7- to 10-day intervals to effect control.

From 6 to 8oz. of seed provide sufficient plants (average 8000) for an acre of summer or winter cauliflower, and 1/16 acre of seed-bed should be allowed for every acre of land to be cropped.

Soil Preparation and Manuring

In the preparation of the land deep ploughing (in proportion to soil depth) is desirable, and in soils with a hard subsoil it is an advantage if the bottom of each furrow is broken with a subsoiler. If the land to be used is in grass, ploughing should be done early enough to allow the turf to rot. Discing of the area before ploughing will help in the breaking up and rotting of the turf. After initial preparation of the land a dressing of carbonate of lime, usually at the rate of ½ ton per acre, should be made. Lime assists materially in the control of club root and sweetens the soil and improves its physical condition. Subsequent cultivation should leave the land well worked.

Seedling beds of cauliflowers. Small-mesh wire netting is placed on beds (at right) to protect the seed until plants emerge.

Though growers employ a wide range of manure mixtures, most applications conform substantially to the general recommendation of 14cwt. of blood and bone, 4cwt. of "super. compound", 1cwt. of sulphate of ammonia, and 1cwt. of sulphate (or muriate) of potash. This mixture applied at 25cwt. per acre on new land, or at from 15cwt. to 1 ton per acre on land which was well manured for a previous crop is usually sufficient.

For summer planting the fertiliser is either broadcast over the area and worked lightly in several days before planting or is sown alongside the plants after they are established and worked in when cultivating.

In late autumn and winter the soil is thrown up before planting into ridges 2ft. 6in. apart with the manure directly underneath.

Selection of Plants

Before the main lifting of seedlings for planting any very gross-growing plants should be removed and discarded. If dry weather prevails, the seed-beds may have to be watered and the plants lifted rather than pulled to prevent excessive root damage. The plants should always be graded to size to ensure even maturity and any blind plants (those with no growing point) and any affected with club root should be destroyed. Blind plants may be the outcome of poorly selected seed or damage by various pests.

During hot weather it is an advantage if portion of the main leaves of plants are cut off to a point just above the heart leaves.

Planting

In summer, mainly for the conservation of moisture, plants are set out on the flat along lines drawn out at 2ft. 6in. spacings across the field. Summer varieties are set out 24in. apart in the rows and winter varieties 28in. The taproot should be kept straight and the soil should be well firmed round it.

For ridge planting, ridges are flattened slightly and the plants are set similarly to those on the flat. During dry periods plants may be watered in. Where club root is suspected, a weak lime water or mercuric chloride (corrosive sublimate) solution should be used in place of water. The value of watering is lost in hot weather unless loose soil is pulled over the watered surface or the latter is broken by hoeing.

Mechanical planters are used in some areas and it has been noticed that on well-prepared land growth of plants set out by machine has been as good as that of plants set out by hand. The machines can be used to advantage, however, only on fairly large and moderately level fields. Mechanical planters work best after the surface has been rolled (not harrowed) and when the soil is in good condition after light summer rains.

Row-crop and Routine Cultivation

Surface cultivation should be frequent and usually consists of at least two hand hoeings between the plants and 5 or 6 inter-row cultivations. Inter-row cultivations can be done most effectively and cheaply by tool-bar attachments to garden tractors or with a 1-horse scarifier. Before the plants grow too large the soil should be

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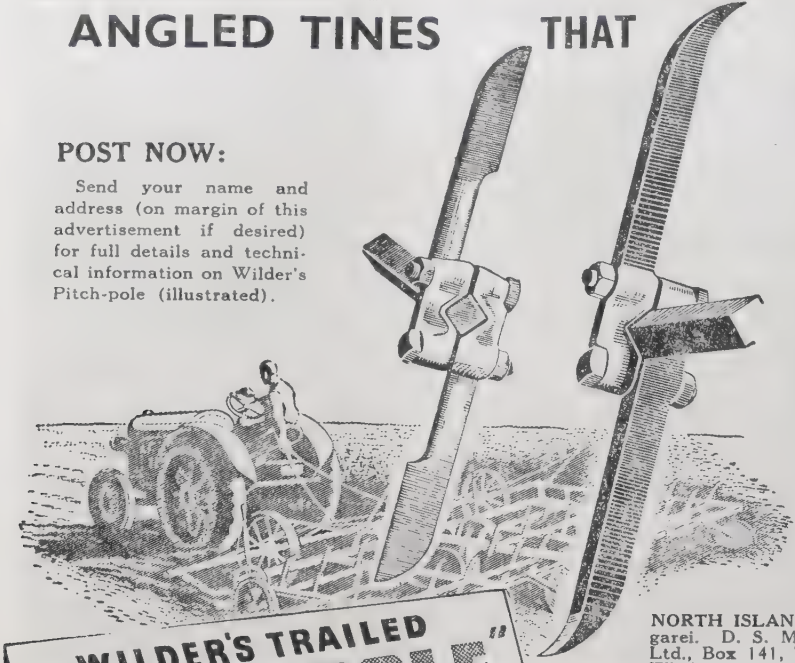

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ridged to afford better drainage and to help to support the plants. In winter plants are kept moulded up from the time of planting. As winter cauliflowers occupy the land for a long period, most crops will need further nourishment and it is a general practice to apply a side dressing of 2cwt. of nitrate of soda or sulphate of ammonia per acre when final ridging is being done.

Field of cauliflowers nearing maturity.

Control of Pests and Diseases

To control pests and diseases cauliflowers have to be sprayed or dusted regularly, and as coverage must be complete, good equipment is needed. Rapid and efficient plant protection is obtained with power-driven spraying outfits, which are preferable for other than small areas to the knapsack sprayers so commonly used.

Club Root

Club root (*Plasmodiophora brassicae* Woron), which is a fungous disease, is common only on acid soils. Once introduced it may be carried over in the soil for a long time. The fungus enters the root system of the plant, causing rounded swellings, or it may cause a swelling at the base of the stem.

Affected plants make little growth and wilt badly in daytime, because the swollen root system interferes with the food supply.

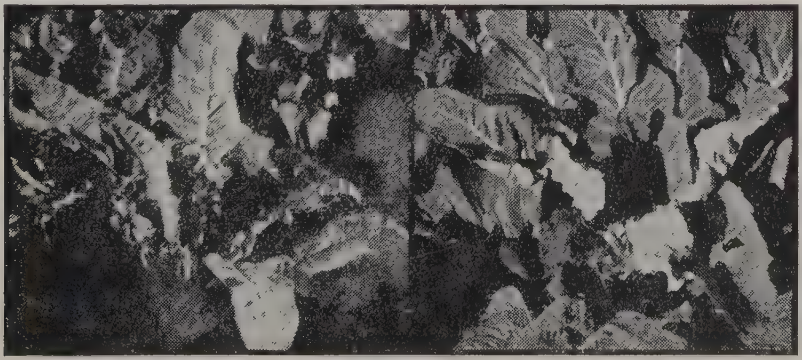
Treatment: As club root is more prevalent in acid soils, a sound remedy is to apply lime to the soil before planting any brassicas. The amount of lime required will depend on the acidity of the soil, but a general recommendation for soil where club root has been severe is an application of 1lb. of carbonate of lime per square yard (2 tons per acre) the first year, to be followed by annual applications of ½lb. per square yard. Drainage should be improved and acid fertilisers such as sulphate of ammonia should not be used. Affected plants should be removed and burnt.

Although liming is a good method of controlling club root, it may not be fully effective for several years.

A more laborious alternative, which must be repeated for each crop, is to use acidulated mercuric chloride. A concentrated solution is prepared by adding 1lb. of mercuric chloride to 1 gallon of concentrated hydrochloric acid. Because of its corrosive properties, the solution must be prepared in an earthenware or glass container. For field treatments 1 pint of the stock solution is added to 25 gallons of water and stirred thoroughly. Half a pint is poured into each planting hole and then the plant is set in the usual way.

For the treating of seedling beds 1 quart of the stock solution is added to 25 gallons of water—1 : 10 : 1000 solution of acidulated mercuric chloride. The solution is distributed as evenly as possible over the seedling bed at the rate of 2 gallons per square yard 2 weeks before the seed is sown. A gallon of water per square yard is applied 1 hour later to further distribute the disinfectant in the soil and to leach out soluble chlorides.

As mercuric chloride is a very dangerous poison, it should be stored in a locked cupboard. White of egg is given as an antidote in cases of mercuric chloride poisoning, but medical assistance should be called immediately. Vessels which have contained the solution must be thoroughly washed immediately after use.



Plant showing whiptail infection (left) and healthy plant (right).

Downy Mildew

Downy mildew (*Peronospora parasitica*) is a common fungous disease on brassica crops and is especially troublesome on young seedlings. Infection appears first on the lower side of seed leaves as a white, mealy or furry growth. Badly affected seedlings or even large plants may be stunted and eventually killed.

Treatment: Overcrowding of young plants in the seedling bed should be avoided, as crowded plants are more likely to be affected by the fungus. Spraying the plants with Bordeaux mixture 3 : 4 : 50, or with copper oxychloride, 5lb. in 100 gallons of water, at 7- to 10-day intervals will give satisfactory control.

Ring Spot

Ring spot (*Mycosphaerella brassicicola*) is fairly common on cauliflowers during wet weather in winter and it is usually commonest where cauliflower crops are grown on the same ground year after year or in soils high in nitrogen.

Circular, brown spots up to ½in. in diameter are formed on the foliage, stems, and seed "pods", and are most abundant on the outer and lower leaves. Diseased leaves become yellow and wither off prematurely.

Treatment: Crop rotation should be practised if the disease reaches serious proportions.

Soft Rot

Soft rot (*Bacterium carotovorum*) may cause considerable damage. Rotting may result in disintegration of the soft, internal tissues of the stem and reduce it to a bad-smelling, slimy mass. The margins of the leaves may also rot. The curds may show brown patches resembling frost injury, which make the cauliflowers unsaleable. Seed production may be prevented.

Treatment: Soft rot often accompanies mineral deficiency symptoms.

Potash deficiency or an unbalance of potash and other essential minerals may bring about marginal leaf scorching, which may be followed by bacterial attack, and boron deficiency may cause internal splitting of the stem and softening of the tissues. Rotation of crops should be practised.

Black Leg

Black leg (*Phoma lingam*) is mainly seed borne and the first signs of the disease may occur on the seed leaves. The most noticeable damage is done to the stem. Light brown or purplish cankers appear on the stem base and taproot and the tissues finally turn black and the roots decay. The plant remains stunted and finally may wilt.

Treatment: Soil which has not carried brassicas for several years should be chosen for the seed-bed. Cauliflower and related crops should not be planted in the same field more than once in 4 years. Only good clean seed should be used.

Damping Off

Damping off, caused by various fungi, shows as blackening at the stem base in the seedling stage and later induces the collapse of the plant.

Treatment: As the plant is attacked in the seedling stage by soil fungi, control can be achieved by sterilising the soil or by disinfecting the soil with formalin or chloropicrin.

Whiptail

Whiptail is a fairly common trouble in the Auckland district and one that sometimes reaches serious proportions. Affected cauliflowers show a peculiar malformation of the leaves, which become strap-like with much-reduced, ruffled, and irregular leaf blades. The curd is coarse and undersized, and has small leaves growing through it.

Time of planting and rainfall apparently have an important bearing on the incidence of the trouble. From observations in the field cauliflowers maturing during May and June are affected more than those maturing later.

Whiptail is believed to be caused by a molybdenum salt deficiency in the soil, and the amount of infection appears to be worse in acid soils, especially those with a pH reading below 6.0.

Treatment: Acid soils should be brought up to a favourable pH level by applications of carbonate of lime ranging from 10cwt. to 2 tons per acre annually.

In trials carried out in different parts of New Zealand favourable results have been obtained in reducing the incidence of whiptail by watering the plants after planting out in the field with a solution of ammonium molybdate or sodium molybdate at the rate of 1lb. per acre. Another method used was to water the plants in the seedling bed 14 days before planting out with a solution of pure ammonium or sodium molybdate (1/10oz. of the molybdenum salt to 1 gallon of water per square yard).

Boron Deficiency

Insufficient boron can lead to stunting and deformity of the leaves immediately surrounding the curd, considerable reduction in size of curd, and the appearance of brownish water-soaked areas on the surface of the curd. The brown areas extend down the inside of the flower branches into the main stem, which is frequently swollen and hollow. The affected head is bitter in both the raw and cooked state. Stems and curd may be invaded by soft rot bacteria.

Treatment: Commercial borax applied at the rate of 30lb. per acre as a soil dressing just before planting out has given satisfactory results.

White Butterfly

The caterpillars of the white butterfly (*Pieris rapae*) are particularly troublesome on cauliflowers and related plants and may cause considerable damage by eating holes in the leaves; on young plants they sometimes devour the whole leaf. The caterpillar is dull, velvety green with a very slender orange stripe down the middle of the back and up to 1¼in. long.

Treatment: Applications of D.D.T. 2 per cent. dust every 2 weeks or D.D.T. 50 per cent. wettable powder, 1lb. in 100 gallons of water, will give satisfactory control.

Diamond-backed Moth

The caterpillars of the diamond-backed moth (*Plutella maculipennis*), associated with those of the white butterfly, are commonly found attacking the leaves of crucifers. The caterpillars are small, pale green, and not over 1/3in. long. When disturbed they wriggle vigorously and drop by silken threads to the ground. They eat small pieces out of the leaves, giving the latter a "shot-hole" effect; leaves are generally eaten from the underside, the upper layer being left over holes as a colourless, semi-transparent skin. Severely attacked plants become stunted and young plants frequently become "blind".

Method of packing cauliflowers.

Treatment: Spraying or dusting the plants with D.D.T. as for white butterfly will give a satisfactory control.

Cabbage aphis (*Brevicoryne brassicae*) is troublesome mainly during spells of hot, dry weather. Colonies of small, greyish-green insects, each about the size of a pinhead, suck the sap from the leaves, causing them to curl and giving a greyish appearance to infested plants. If not controlled, the aphides may cause serious damage and may even kill the plant.

Treatment: To control aphides plants should be sprayed with nicotine sulphate, 1 part in 600 parts of water, to which 3lb. of soft soap has been added. Nicotine sulphate sprays give best results when applied at the warmest part of the day. Applications should be repeated if aphides reappear.

A new combination dust containing a mixture of D.D.T. and benzene hexachloride is being used by some Auckland growers, as it gives a satisfactory control of white butterfly, diamond-backed moth, and aphis; it is not advisable to use this control within 3 weeks of harvesting the crop, because of a possible residual taint.

Harvesting and Packing

Cauliflower should be harvested as they mature and before the curds reach full size. Over-mature "ricy", or seriously damaged heads are not required by the markets. The crop seldom matures evenly, and therefore it is usually necessary to make several cuttings in each field. During frosty periods cauliflowers should be cut only in the middle of the day when the temperature is rising. Earlier cutting will damage the growing crop and impair the keeping quality of the heads.

The heads should be severed just below the second ring of basal leaves; that is, leaving 3 or 4 bottom leaves on the stumps. The cutters should make flat cuts, as slanting cuts may sever too many wrapper leaves and give unbalanced protection to the curd. The wrapper leaves should be trimmed so that they do not project more than 6in. above the surface of the curd, and sufficient foliage should be left to ensure a firm pack without damaging the curd. The heads are graded mainly according to size, but also according to colour and condition of the curd.

In the Auckland district the main containers used are reconditioned fertiliser sacks, which hold about 24 heads of first-grade cauliflowers, and the banana cases into which 16 to 18 first-grade heads can be packed. The only satisfactory package for distant travel is the rigid crate. In packing, the leaves are drawn over the curds, which are placed to face inward with the butts to the outside of the container. Containers, whether crates or sacks, should be filled compactly but without crushing the heads. Faulty grading and packing or careless handling tend to depreciate the value of the crop.

Using Firearms Safely and Skilfully

CONTINUING the series of articles which was begun in the March issue of the "Journal" and which deals with the safe and skilful handling of firearms, G. G. Kelly, Arms and Ballistics Officer to the Police Department, this month describes types of sporting rifles and ammunition and the setting of sights. In next month's issue he will discuss the use of shotguns.

Four types of sporting rifles. Top—A .303 single-shot Martini carbine. Upper middle—A .22 Hornet high-velocity rifle, of Czechoslovakian make. Lower middle—A .303 Short Magazine Lee-Enfield converted to a sporting rifle. Bottom—A 7.9 mm. Mauser magazine rifle.

FOR destruction of deer, wild pigs, goats, and scrub bulls the weapon selected should be capable of dealing effectively with the heaviest and toughest of the four types of animal, the scrub bull; it will then be powerful enough to kill the other three kinds quickly and mercifully. A good killing combination of bullet weight and velocity (energy) is 150 grains and 2500ft. per second. Broadly almost all types of military rifles meet this minimum. The British rifle, the Enfield in its various forms, is quite suitable, with the added advantages of being reasonably priced and using a cartridge that is made in the Dominion. Its bullet weight is 174 grains and muzzle velocity 2440ft. per second; its initial energy is 2300 foot-pounds. The cartridge is known as the British Mark VII.

The Enfield rifle is shown above in two forms. One is the single-shot Martini carbine, with a 20in. barrel, and the other a Short Magazine Lee-Enfield which has been converted to a sporting model by the reduction of the woodwork; its barrel is 25¼in. long. For heavy bush country the short weapon is usually preferred, as it is light and handy. The one shot available is sufficient where the animal is sighted for a flash only, or, if it is standing, is close enough to allow of a well-placed bullet.

In more open country the longer rifle allows of a second shot or more if needed. The longer sighting radius is an assistance to accuracy of aim.

Bullet Design

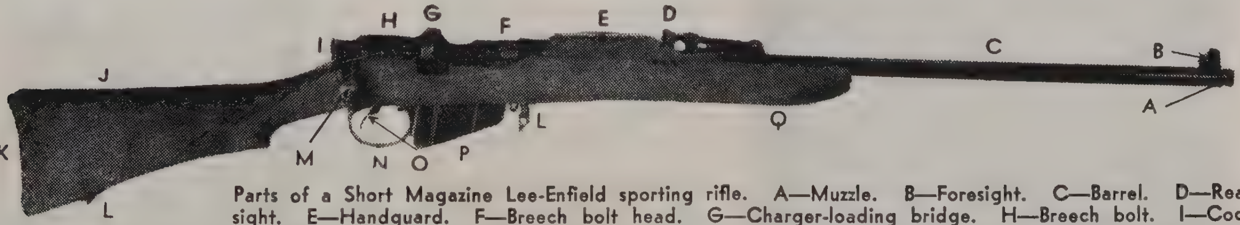
Bullet design is repeatedly discussed by hunters, whose opinions differ widely. The usual attitude is that to have maximum effectiveness the ball should be of the expanding type which collapses, mushrooms, or breaks up after penetration, thus spreading its energy and destructiveness over as wide an area as possible. The subject cannot be dealt with at length in this series of articles. After many experiments with bullet modifications workers of the Wild Life Branch of the Department of Internal Affairs have found that these modifications do not materially add to the effectiveness of the Mark VII bullet. It is understood that the ammunition is now used entirely "as issued", with satisfactory results.

High-velocity ammunition of this kind should be treated with care and respect. Any modification or alteration to the ball should not so weaken the structure of the bullet that it would be possible for it to separate from the bullet casing in the bore, leaving the casing there to obstruct the passage of a following shot. This cause of accident, known as barrel obstruction, though rare, has been known to cause the bolt head to burst and permit hot gases and pieces of metal to blow in the user's face. As the pieces of the bolt head are highly dangerous missiles, great care should be taken in any alteration to the bullet. The wiser course is either to use factory-made expanding-type bulleted ammunition or to use the ammunition "as issued".

Another military rifle that may become available in quantity to farmers is the American service rifle known as the .300 Springfield. The cartridge used in this rifle in the past was known as the .30 '06 (.30in. calibre pattern of 1906). It is loaded with a 150-grain bullet having an initial velocity of 2900ft. per second. This is also a satisfactory combination for deer, wild pigs, goats, and scrub bulls.

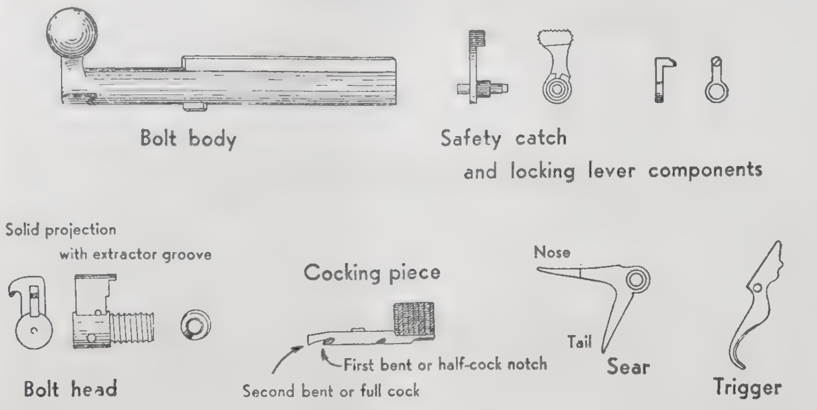
The German Mauser of 7.9 mm. shown in the illustration above as a converted sporting rifle is common in the Dominion. Ammunition is scarce for it and all has to be imported. It develops about the same energy as the American rifle (154 x 2800). Nearly all the ammunition for it has soft-pointed bullets and is fairly expensive.

The fourth rifle shown above is a Czechoslovakian sporting rifle that shoots a cartridge evolved by the Americans and known as the .22 Hornet. It has a very light bullet of 45 grains and relies on its high velocity of 2600ft. per second to develop enough energy to destroy such animals as goats and pigs. It is not quite satisfactory for anything heavier than goats and smaller deer. Its ammunition is not readily available and is also fairly expensive.



Parts of a Short Magazine Lee-Enfield sporting rifle. A—Muzzle. B—Foresight. C—Barrel. D—Rearsight. E—Handguard. F—Breech bolt head. G—Charger-loading bridge. H—Breech bolt. I—Cocking piece. J—Butt. K—Butt plate. L—Sling swivel. M—Breech bolt lever. N—Trigger guard. O—Trigger. P—Magazine. Q—Fore-end.

MAIN COMPONENTS OF FIRING MECHANISM OF LEE-ENFIELD RIFLE



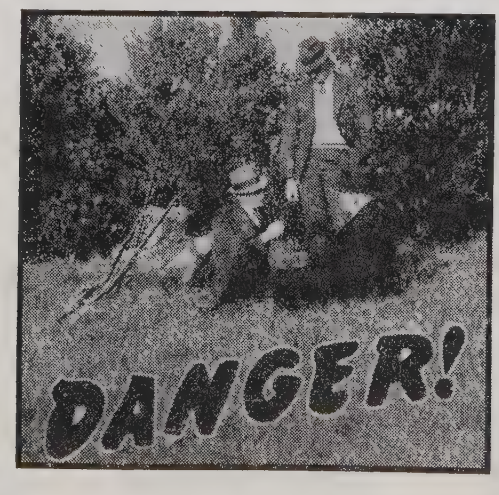
Setting of Sights

Because .303 rifles are so numerous, a simple means of setting the sights accurately is described below. This system is called by target riflemen "getting the zero", but, though it receives the closest attention by them because of its utmost importance, it is almost entirely neglected by other shooters. Rifles "as issued" are very rarely perfectly sighted in. Even if they were, the setting would not suit all users, as eyesight differs in individuals.

The setting of the sights, though important, is really simple. Every marksman must set his own sights according to his ideas of aiming. He should set his sights for one range that will serve him for all his needs. To set sights shots should be fired at 25yds. at a mark the shape and size of a penny. The shots should be taken from the prone position, with the left wrist supported by a roll of sacking or some soft material. All the sight shots must be the same for the practice. The aiming "picture" should be the same, with great care exercised that the space between the top of the foresight and bottom of the mark does not vary.

In these operations the correct sighting for 200yds. is "zeroed" when the bullets are grouping just above the penny mark at the top of the curve. During the work of "zeroing" it will probably be necessary for the sights, or one of them, to be moved. If the rear sight is adjustable laterally, it should be moved to the right if the shots are required to strike that way and to the left if it is desired to move the group to the left. If the foresight has to be moved, these movements have to be reversed. Rear sights are nearly all capable of being moved up or down. Movements need to be very slight to move the "grouping" up or down.

This method of sight setting would not suit all the needs for the man who desires perfection. However, it is intended as a guide to the farmer who wishes to ensure that he has a reasonable chance of success in his work of destroying his quarry with the smallest expenditure of effort and ammunition. When the sights are correct for 200yds. he will need no further alteration for most of his shots. He will find it expedient to fire a little lower for short ranges and to aim a little higher for longer ones.



LEAVING loaded firearms, especially exposed-hammer shotguns, resting insecurely against a tree, bush, or fence in such a way that the slightest bump or movement can cause them to slip is a frequent cause of shooting accidents. Even though triggers or exposed hammers may not strike projections, many firearms have defects which can cause them to discharge on impact with the ground.

Before firearms are put down, even for a moment, they must be unloaded.

Judging Range

Judgment of range is difficult, but a fair degree of accuracy can be attained by practising the art in everyday walking about the farm. First distances to be judged should be from 25 to 50yds. and after proficiency in judging these has been reached longer distances up to even 300yds. can soon be estimated to within small margins of error. Excellent practice can be obtained by fixing a distant object, guessing its distance, and then measuring the distance by pacing it out. The usual experience is that the distance stepped is rarely as far as it appeared to be. Ability to do this exercise will pay dividends, but it will be of little value unless the sights have been correctly "zeroed".

Rifle club members are required to place the bulk of their shots at 300yds. within a circle of 7½in. and at 500 and 600yds. within a circle of 15in. The leaders in competitions do this regularly, which demonstrates the capability of rifle and cartridge. Game shooting is much more difficult because of the conditions under which shots have to be fired, and such fine shooting is not to be expected. On the other hand, the grouping of shots can be effective over a wider target. In practical work most deer and pigs are killed at less than 100yds.

Cleaning Rifles

To get the best results from .303 rifles they must be kept clean. Unlike the .22 rifle, this calibre does not have stainless primers. If neglected, the service barrel very quickly becomes rusty and almost useless.

The rifle should be cleaned as soon after shooting as possible. Hot water should be poured through the barrel from the breech and the barrel immediately wiped out with cloth patches; very loose patches should be used at the start and the wiping continued until the bore is quite dry. The heat will assist the drying. The rifle should be left for 10 minutes while the hot steel throws off any moisture which may have escaped the patches. The bore should then be wiped out with a light coating of petroleum jelly. The rifle must be wiped clean before it is fired again. The use of muzzle stoppers or of barrel rods left in the bore is not recommended, and the practice can be dangerous.

The bolt and body should also be oiled from time to time, but care should be taken to avoid applying an excess of oil. If too much oil gets into the bolt, there is a risk of the shooter's eyes getting unpleasantly filled with oil when a shot is fired. Many men have the habit of putting a rifle away with the muzzle pointing down so that excess oil can run out of the muzzle.

The Lee-Enfield rifle should never be uncocked when there is a cartridge in the breech. The point of the firing pin is then pressed against the primer and a blow on the cocking piece will probably cause an accidental shot. The half-cock position locks the mechanism safely.

Many careful and experienced sportsmen do not load the chamber of the rifle until a shot offers. They unload immediately if the chance passes.

Purpose of the Annual Return of Sheep

By the Animal Industry Division

SHEEP SCAB is an extremely contagious disease of sheep causing serious economic loss in some parts of the world. Its eradication in most countries has been slow and difficult—it still exists in Britain, for instance—but it was stamped out in the 1880's in New Zealand.

LEGISLATION which empowered the work of eradication was incorporated in the Sheep Act 1878, and under this Act sheep farmers were first called on to make an annual return of sheep. At that time 31 May was the date on which the count was to be made and 30 June the last day for sending in the return. The Sheep Act 1878 has since been incorporated in successive Stock Acts, including the Stock Act 1908, which is now current. Later 30 April was fixed as the date on which the check was to be made and the figures recorded. In 1950 the date was changed to 30 June, the greater suitability of which is obvious, as stock numbers are at their basic level at that time.

Value of Statistics

In addition to details of numbers, breeds, and ages, the sheep farmer is asked to give particulars of his registered earmark and livestock brand. These are of value in checking of the registered brand system which is kept by the Department of Agriculture by desire of and in the interests of farmers. (Registration of brands and earmarks is compulsory; application for registration should be made to an office of the Department of Agriculture or to a Stock Inspector.)

The particulars about dipping are valuable for statistical purposes and in investigating the efficiency of dips and dipping materials.

The most important part of the return (page 2 of the form) is reproduced on this page. It calls for details of breeds, numbers, and ages of the sheep carried. The collation of these details by the Government Statistician allows information about wool-type trends and probable production of wool, lamb, and mutton to be made available for the benefit of the sheep-farming industry.

Sheep owners should regard the sheep return not merely as another Government form, but as a document important to themselves and to their industry. It is the basis of the only complete and reliable statistics about New Zealand sheep farming.

The return is also the basis on which farmers having more than 100 sheep are permitted to vote in the election of the electoral college which elects producer members of both the New Zealand Meat Producers Board and the New Zealand Wool Board.

In part A only stud sheep entered in a flock book are to be shown. Part B applies to all other sheep on the farm, and particulars must be given under the appropriate headings for each breed type carried.

THE STOCK ACT, 1908

TOTAL number of sheep owned by me on 30th June, 1952, depasturing on the property known as THE SHEEP STATION, situate in the county of ANYWHERE

(If owners occupy more than one property, a separate return must be made for each):—

A. STUD SHEEP (only sheep entered in Flock-book to be shown).

Breed. (State name of Breed).	Stud Rams, 2-tooth and over.		Stud Breeding Ewes—*i.e.*, Ewes put to Ram this Season.	Stud Dry Ewes—*i.e.*, Ewes not put to Ram this Season.	STUD HOGGETS.			Total.
					Ram.		Ewe.	
Romney	4	▨	217		90	▨	90	401
		▨				▨		
		▨				▨		
		▨				▨		

B. ALL OTHER SHEEP (No sheep entered under A to be included.)

Breed. (State name of Breed.)	Rams, 2-tooth and over.	Wethers, 2-tooth and over.	Breeding Ewes—*i.e.*, Ewes put to Ram this Season.	Dry Ewes—*i.e.*, Ewes not put to Ram this Season.	HOGGETS.			Total.
					Ram.	Wether.	Ewe.	
Romney	16	25	950			45	300	1336
Southdown	8							8
Crossbred		15						15

TOTALS OF ALL SHEEP ENTERED IN A and B.	TOTAL, RAMS.	TOTAL, WETHERS.	TOTAL, BREEDING EWES.	TOTAL, DRY EWES.	TOTAL, HOGGETS.			GRAND TOTAL ALL SHEEP.
					Ram.	Wether.	Ewe.	
	28	40	1167		90	45	390	1760

CORRECT X Y Zero Inspector of Stock.

16/7/52

394—SHEEP RETURNS . . .

In the early years of this century crossbred was a true description of most of New Zealand's flock sheep, for they were a mixture of several breeds. Now, however, the Romney ram has been used exclusively and for so long in many flocks that those sheep are to all intents and purposes Romneys and should be entered as such in the returns. If Romney rams are used for five generations on a nondescript flock, the fifth generation of descendants is 31/32 Romney—nearly enough pure to be classified as Romney.

However, if a farmer changes his breed of rams to, for example, Corriedales, the progeny once more become crossbreds, and not until Corriedale rams have been used exclusively for at least five generations—that is, the progeny right down to the great-great-great granddaughters have all been put to Corriedale rams—does the flock become of a pure enough strain to be considered as Corriedale.

Confusion of Terms

Probably the main reason for confusion having arisen in New Zealand about such terms as crossbred and half-bred is that the wool trade uses these terms in special senses having different meanings from those commonly understood by farmers. The prominence given to wool sale reports has resulted in these terms becoming widely known but improperly understood. With the exception of Merino, Southdown, and perhaps Lincoln, breed names are not used in sale reports. Wool up to 50's count is termed crossbred whatever its breed, the finer counts such as 54's and 56's are called half-bred, and 60's or finer are always Merino. Finer distinctions also are used in the trade, such as three-quarter-bred (50-52's) and quarter-bred (58's).

Therefore the term crossbred as applied to wool and wool classing should be ignored in relation to breed, the only crossbreds to be shown on the form being those which have been defined.

Meaning of Half-bred

The term half-bred has also acquired a special meaning in New Zealand farming not used elsewhere. It means the progeny of the first cross between the Merino and one of the long-woolled breeds, for example, the Lincoln or English Leicester.

The first crosses of other breeds such as the Romney and Southdown should not be termed half-breds, but if they are kept in the flock, they should be entered as crossbreds.

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New Bulletin on Sheep Feeding in Canterbury

Canterbury has a balanced and well-developed sheep industry based on store-sheep production on the hill country and fat-lamb production on the plains. More than 5,000,000 sheep are carried, producing about 50,000,000lb. of wool and 2,500,000 fat lambs a year. In this state of high productivity feeding is the most important factor, and that is why every sheep farmer in the province will find much to interest and enlighten him, and perhaps to surprise him, in a new Department of Agriculture bulletin, "Sheep Feeding in Canterbury". The authority is I. E. Coop, Professor of Animal Husbandry at Canterbury Agricultural College, Lincoln, and the bulletin, No. 355, is obtainable free from any office of the Department of Agriculture.

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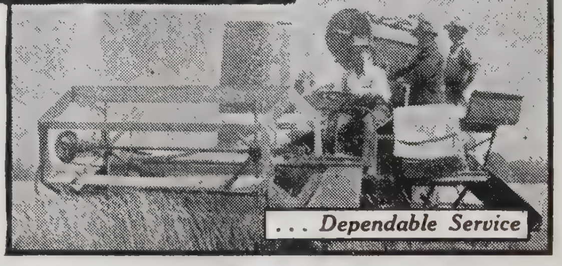
Upkeep of Farm Machines

Off-season Maintenance . . .



. . . Dependable Service

By C. J. CROSBIE,

Farm Machinery Officer,

Department of Agriculture,

Christchurch

THE present extent of farm mechanisation and the high cost of replacing unserviceable machines necessitate close attention both to running maintenance and to regular and thorough overhaul of all mechanical equipment on the farm. Irrespective of the number of wearing parts, all machines wear out to some degree both in use and in storage during idle periods. Wear and deterioration are more rapid where maintenance and repair work are neglected.

THESE FACTORS are essential to economical running costs and long and dependable service: Thorough and regular lubrication of all frictional surfaces, especially bearings and gears; frequent and systematic inspection and tightening of studs, nuts, and pins which tend to loosen in incessant vibration; periodical checking and cleaning of fuel and ignition systems; immediate repair or replacement of parts badly worn or damaged during working; sheeting of equipment and machines standing in the open; thorough cleaning and oiling of corrodible parts and repainting of iron and woodwork before winter storage; and adequate housing of all equipment during the off season.

Winter Overhauls

Major overhauls and repair work are appropriately done in winter between working seasons. The extent to which this work can be carried out on the farm by the farmer depends to some extent on the workshop facilities available and the mechanical aptitude of the farmer. Nevertheless, most repairs except those of an advanced technical nature can be carried out adequately by farmers with the average farm workshop facilities.

Before storage all bright parts such as plough mouldboards and mower knives should be cleaned and coated with waste oil or grease. Manure distributors and spray equipment deteriorate rapidly if not thoroughly cleaned of corrosive materials before storage. Cutter bars on mowers or header harvesters may need adjustment. Plough beams, mouldboard brackets, coulter stalks, and drawbar hitches should be checked and realigned where necessary. Worn shares should be repointed or replaced. All equipment should be thoroughly checked for loose nuts and adjustments, missing lock washers, and damaged or broken grease nipples. Unserviceable oil and dust seals should be replaced. Broken or badly worn parts temporarily repaired during the previous working season should be renewed and worn disc bearings and cracked blades replaced.

Decarbonising and valve grinding of tractor and stationary engines should be attended to, fuel and oil systems flushed out, and oil replenished. Such major items as repairs to big ends, renewal of pistons and piston rings, turning of track roller pins, and adjustments to fuel pumps and ignition equipment usually require the services of a qualified mechanic with special workshop facilities. Stocks of spares normally carried should be replenished when repair requirements are ordered.

Readiness for Service

These are not all the items that may call for attention during the annual overhaul. The important point is that all machines and equipment should be checked and serviced thoroughly in readiness for the coming seasonal operations if satisfactory performance and long service are to be achieved.

Photographs by National Publicity Studios.

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Recent Research Work

FERTILISER UPTAKE

A NEW AID to the research worker that has been developed in the past decade is the use of radio-active isotopes of elements as tracers. The technique has been applied to some extent in the Department of Agriculture's laboratories at Wallaceville Animal Research Station and Rukuhia Soil Research Station.

RADIO-ACTIVE PHOSPHORUS

AN INITIAL EXPERIMENT on permanent pasture in which the uptake of phosphate, applied both as superphosphate and as sheep dung, was followed on two contrasting soil types was completed at Rukuhia last year. The procedure was to incorporate with the phosphate treatment a minute amount of radio-active phosphorus (P^{32}) in known proportion to the ordinary phosphorus (P^{31}) present, the two forms of phosphorus being in the same chemical combination. With special apparatus the content of P^{32} can be accurately determined in the herbage yield.

On the assumption that the proportion of P^{32} to P^{31} will be the same in the herbage as in the fertiliser, the phosphate uptake of fertiliser origin as distinct from that of soil origin can be calculated. The radio-active phosphorus behaves chemically exactly like the natural element, but breaks down to sulphur at a fixed rate with emission of B-rays. It serves to label the fertiliser containing it.

TRIALS ON WAIKATO SOILS

IN THE EXPERIMENT mentioned radio-active dung was obtained from sheep grazed on pasture fertilised with "labelled" phosphate. Strips of Horotiu sandy loam and Te Kowhai loam were treated with this dung and also with "labelled" superphosphate, and the course of uptake in the pasture was followed at 4-day intervals for 10 weeks.

The increase in phosphate uptake above that on control strips was practically the same on the two soil types. On Te Kowhai loam this increase was of fertiliser origin, but on the Horotiu sandy loam plots the increased phosphate uptake seemingly was derived to a considerable extent from original soil phosphate. The possibility of such a result being induced through factors associated with the method is under investigation. The apparent recovery of applied phosphate during the period was three times as great on Te Kowhai loam as on the Horotiu sandy loam, a soil type with a marked capacity for fixing phosphate. On both soil types the figures for dung and superphosphate were similar.

SUPERPHOSPHATE AND REVERTED SUPERPHOSPHATE

A SECOND EXPERIMENT compared the use made of superphosphate and of reverted superphosphate on Horotiu sandy loam. Results are still under examination, but it would appear that the superphosphate was used to maximum extent from the time of application, but the effect of reverted superphosphate was slow to develop. By the end of 3 months the uptake from reverted superphosphate equalled that from straight superphosphate. At the close of the trial there was no indication of the reverted superphosphate remaining effective longer and making up for its low initial effect.

The activity of P^{32} diminishes to half value every 14.3 days, so experiments such as those described can be carried on for only a limited time.

—E. B. DAVIES

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FERTILISER PLACEMENT

RESEARCH and standard farming practice in many countries have shown that considerable increases in yield and economy of fertilisers can be obtained by concentrations of fertilisers accurately placed in relation to the seed at the time of sowing and in some cases during the growing period of the crop. In recent work overseas with radio-active isotopes it was found that wheat plants grown from seed drilled at 6in. centres did not absorb phosphorus from adjacent rows, thus pointing to the need for accuracy when placement is used.

Depth of placement is also important, as it is well known that very little nutrient from phosphatic fertilisers is able to penetrate very far into the soil in solution. Overseas investigations of the phosphorus nutrition of grape vines growing in a high "fixing" soil which failed to respond to dressings of 620lb. of P_2O_5 per acre showed that very little phosphorus from the surface of the soil entered the plants compared with that from dressings placed 15in. below the surface. When a dressing of 2300lb. of P_2O_5 per acre was applied to the surface and watered in, after 11 days 99 per cent. was found to be still in the first 6in. of soil.

TRIALS WITH SWEDE CROPS

PLACEMENT TRIALS with swedes have been conducted at Rukuhia Soil Research Station during the past 3 years on two different soil types, one of which is capable of fixing phosphate rapidly into an insoluble state unavailable to the crop. The treatments compared the effects of fertiliser broadcast on the surface and of fertiliser broadcast and harrowed in with those of various band placements 2in. from the seed and below and fertiliser used with the seed and beneath. The broadcast treatments produced crops so poor that they must be considered failures. The band placements on the surface were a little better, but the best results were consistently those from deep band placements below the seed.

Swedes are deep rooted and have a long growing period, and the placement of fertilisers within a few inches of the seed should not be expected to have a differential effect throughout the life of the crop. Results of overseas research corroborate this, but strong early growth and the establishment of a deep and extensive root system as soon as possible while soil moisture is adequate may well be the difference between success and failure of the crop.

INJURY TO SEED

IF CONDITIONS ARE DRY for some days after sowing, superphosphate drilled with seed may cause serious damage to it and may prevent or reduce germination. This trouble also occurs with potassic and nitrogenous fertilisers. In view of this danger serpentine superphosphate was used in this series of experiments. This fertiliser, like lime-reverted superphosphate, has a beneficial and stimulating effect on swede seedlings and had no detrimental effect on germination; observations and germination counts during early establishment consistently proved this to be so in these trials.

NITROGEN AND POTASH

SIMILAR TRIALS with swedes using various placements of nitrogen and potash in conjunction with a standard application of serpentine superphosphate have not so far shown any significant differences. As nitrogenous fertilisers are water soluble and therefore capable of moving down into the soil with the moisture, particular differences from various placements close to the seed are unlikely to occur. Potash salts, though soluble in water, become absorbed by the soil colloids and do not leach downward to the same extent.

Potash and all nitrogenous fertilisers are injurious to germination and should not be put in contact with the seed.

FERTILISING OF POTATOES

PLACEMENT obtained by broadcasting fertiliser over the furrows before splitting to cover potato seed has been found in England to give good results. The fertiliser is concentrated in the centre of the ridge with and above the seed, which results in a high proportion of the roots growing under the ridges and thus reduces damage caused by cutting of the roots during earthing up. Another advantage is that competing weeds have less access to the fertiliser.

—H. A. BROWNING

Benefits of Summer Fallow to

Pasture Establishment in Taranaki

By A. C. BURGESS, Instructor in Agriculture, Department of Agriculture, New Plymouth

FAVOURED with a plentiful and evenly distributed rainfall, the light volcanic soils of Taranaki can grow good pastures provided that they are topdressed with phosphates regularly and that potash is applied when required. However, good pastures are not easy to establish on these soils after cropping, because the necessary clean, firm seed-bed is difficult to obtain, especially if greenfeed, cereals, oats, barley, or millet were the last crop grown before the land was seeded to grass. Many sorts of weeds are prevalent and thrive under the good rainfall, and the more the land is cropped the worse the weeds become. Though these soils build up a desirable crumb structure under grass, too much cropping breaks this structure down, the soil becoming loose and soft and very difficult to consolidate.

IN the preparation of this type of land for grass the value of a summer fallow, during which weeds can be dealt with by cultivation and the soil has time to consolidate from below upward, has been well demonstrated.

Where supplies of hay and silage are ample and supplementary crops are not required it is best to proceed straight from old grass to new. The land should be ploughed as deeply as possible in late spring or early summer, rolled on the furrow, and given a double discing immediately. This should be followed by periodic discings and harrowings with an occasional rolling during summer to keep the land clean and conserve moisture. The final preparation in February consists of discing, harrowing, levelling if required, and rolling. The seed should be sown before the middle of March, covered with a light brush, and rolled again. This preparation maintains the original crumb structure, conserves moisture, and gives the ideal clean, deep, firm seed-bed ready for seeding at the best time.

Where supplementary crops are required the cropping should be kept to the minimum necessary and cereals not grown if good pasture establishment is the aim. After a winter-feed crop such as chou moellier or swedes the land should be ploughed in spring before the weeds get away and put through the summer fallow as for grass after grass, with occasional cultivations to keep it clean and conserve moisture. With this preparation perennial weeds can be eliminated, moisture is conserved, any levelling required can be done, and time and the weather can help improve the soil texture and consolidate the ground from the bottom to the top.

Autumn sowing is generally favoured in this district because of the weed problem, and these two methods of land preparation for regrassing are rapidly gaining favour because of the good results obtained.

To encourage good methods of pasture establishment competitions have been held in north Taranaki for several seasons. In 1950-51 entries numbered 21, of which only one did not develop immediately into a good pasture; it was sown on land which had been cropped a lot.

First place went to Mr. R. Wilson, of Urenui. His paddock was giant disced out of old grass for a crop of swedes. These were followed by chou moellier after another giant discing. After the chou moellier had been fed off the land was fallowed through the summer and sown in autumn. With each crop 5cwt. of phosphate fertiliser was used, and 4cwt. was applied when the grass was sown. The final preparation consisted of discing, harrowing, and rolling, with another rolling after the seed was sown.

Second place was taken by Mr. K. Watson, of Tarata, who established a very promising pasture on second-class land. A good crop of swedes averaging 50 tons per acre was followed by a crop of mangolds of 74 tons per acre. The land was then fallowed and cultivated until late February, when the seed was sown. Instead of being rolled the seed was tramped in with sheep. With each crop 5cwt. of fertiliser was used, and the same amount was applied with the grass seed.

Mrs. M. Weedon, of Pukearuhe, gained third place with a pasture established on drained swampland. After being drained and levelled the land was ploughed early, disced many times through the summer, and levelled again. The seed was then sown and trampled in with sheep.

All three prize-winning paddocks had the advantage of a long summer preparation, early sowing, and careful grazing management in the early stages. All the pastures entered were sown with Certified grass and clover seeds. The seeding rates varied from 38lb. to 60lb. per acre, the prize winners sowing 50, 45, and 40lb.

Whether grass seed is to be sown after old grass or after crops, a summer fallow is of great advantage to pasture establishment on such land as this on the light volcanic soils of Taranaki.

Radio Broadcasts

RADIO broadcasts will be given to farmers as follows:—

1YA Auckland, 7.15 p.m.

4 June—"Farm Drainage", by H. Woodyear-Smith.

11 June—"Country Girls' Clubs", by N. C. Macpherson, Rural Sociologist, Department of Agriculture, Auckland.

18 June—"Shrubs for the Home Garden", by M. J. Lockie, Horticultural Instructor, Department of Agriculture, Auckland.

25 June—"Y.F.C. Session", by Far North District Committee of Federation of Young Farmers' Clubs.

1XH Hamilton, 12.30 p.m.

5 June—"Sheep Abortion", by D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton.

12 June—"Drainage", by H. M. Bull, Instructor in Agriculture, Department of Agriculture, Hamilton.

19 June—"The Problem of Cattle in the North Island", by L. K. Wilson, Meat and Wool Section, Federated Farmers, Hamilton.

26 June—"Deficiency Symptoms in Crops", by K. J. McNaught, Agricultural Chemist, Department of Agriculture Soil Research Station, Rukuhia.

1YZ Rotorua, 7.15 p.m.

12 June—"Planting and Pruning of Fruit Trees", by F. L. Bailey, Orchard Instructor, Department of Agriculture, Tauranga.

26 June—Talk arranged by Eastern Bay of Plenty District Committee of Federation of Young Farmers' Clubs.

2YZ Napier, 7 p.m.

10 June—"The Meat Inspection Service", by J. Thornton, Supervising Meat Inspector, Department of Agriculture, Hastings.

24 June—"Drainage", by R. H. Lawrence, Assistant Instructor in Agriculture, Department of Agriculture, Hastings.

3YA Christchurch

12 June (7.15 p.m.)—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Fields Instructor, Department of Agriculture, Rangiora.

16 June (12.20 p.m.)—"Vaccination of Sheep against Blackleg and Pulpy Kidney", by A. Howse, Veterinarian, Department of Agriculture, Christchurch.

30 June (12.20 p.m.)—Talk by J. Bishop, South Canterbury District Committee of Federation of Young Farmers' Clubs.

4YA Dunedin, 7.20 p.m.

4 June—"Y.F.C. Activities", by G. W. Niven, Otago-Southland Council of the Federation of Young Farmers' Clubs.

18 June—"The Value of Bees as Plant Pollinators", by I. Forster, Apiary Instructor, Department of Agriculture, Oamaru.

Other Talks

1YA Auckland on Tuesdays at 12.35 p.m., 1YD Auckland on Thursdays at 7.30 p.m., 1XN Whangarei on Mondays and Wednesdays at 8.10 p.m., 2XG Gisborne on Tuesdays at 8 p.m., 2XA Wanganui on Thursdays at 8 p.m., 3XC Timaru on Wednesdays at 8.5 p.m., 4YZ Invercargill on Mondays at 12.30 p.m.

"Ground Water in New Zealand"

In the article "Ground Water in New Zealand", which appeared in the March issue of the "Journal", an error occurred in a reference on page 166 to a group of water-bearing rocks. The reference "Group 1" in the sentence at the beginning of the middle column of the page, "Group 2: Sedimentary rocks younger than those of Group 1", should have read "Group 3".

Apricot Culture

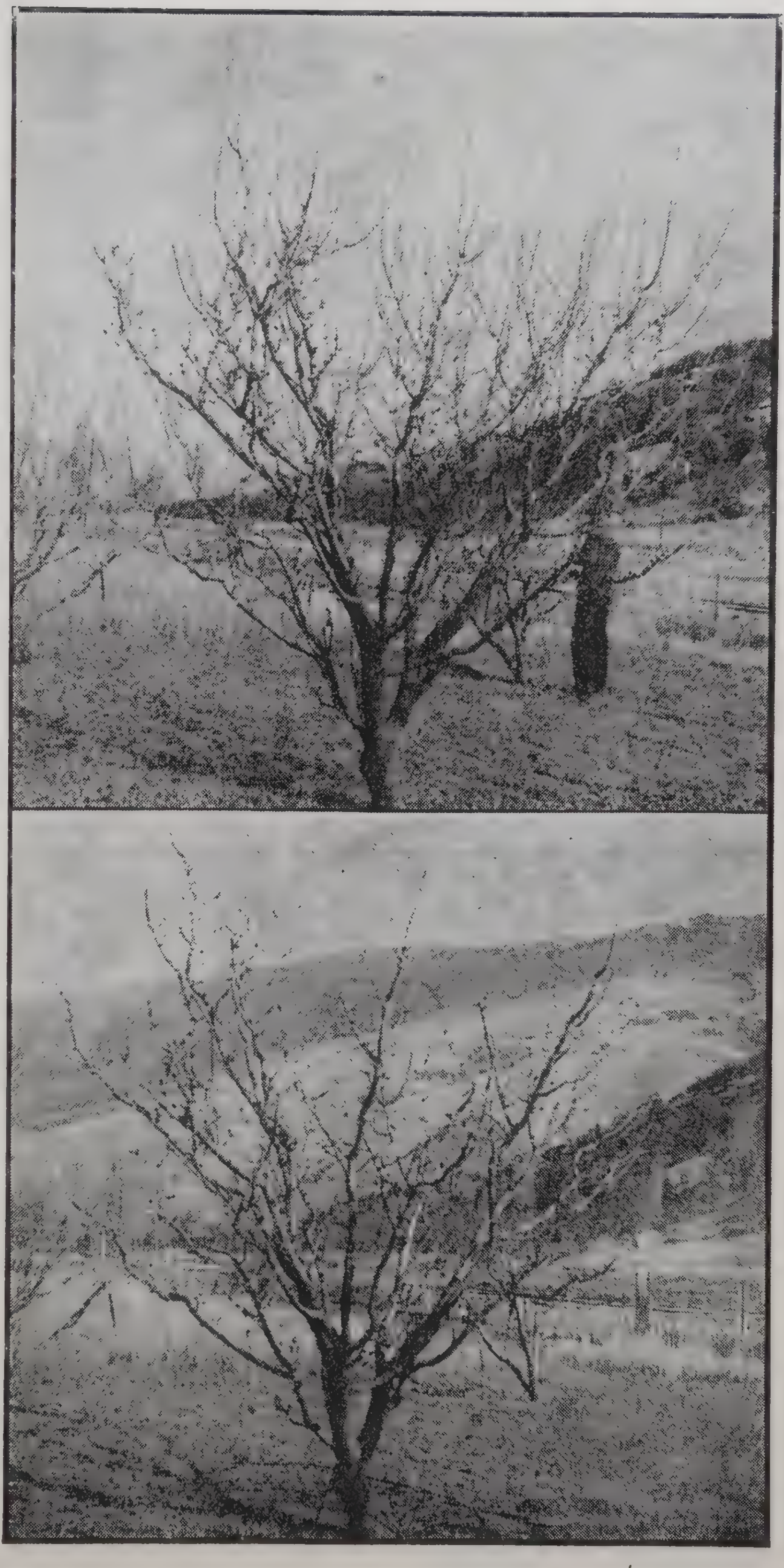
FACTORS in apricot culture such as soil and climatic conditions were dealt with in the first section of this article by J. Coombe, Horticultural Instructor, Department of Agriculture, Roxburgh, which appeared in last month's issue of the "Journal". In this, the concluding part, pruning, harvesting, cool storage, and control of diseases and pests are among the subjects discussed.

DURING the first few years the object of pruning should be to develop a tree with a strong framework capable of carrying large crops and to build this framework in such a way that during later years cultural operations such as spraying, thinning, harvesting, and cultivation can be done with ease and economy. The first pruning after planting should be carefully carried out, as it is at this stage that the foundation of the framework is laid. The pruning is also important to secure balance between the top and the roots. As a portion of its rooting system is lost when the tree is transferred from the nursery, it is essential that the top should be reduced accordingly, otherwise weak, thin growths will develop. At the first pruning three evenly spaced, well-developed shoots should be selected and pruned back to about a quarter of their length, all other growths being removed. In shortening these growths care should be taken to see that they are cut to buds facing in the direction in which the leaders should grow; generally two leaders are required from each. Frequently young trees have two strong branches and a weaker one. In such cases the weak one can be assisted by leaving it a little longer than the stronger ones and cutting it so that it carries on as a single leader, while the strong ones are cut to buds from which they can be forked to produce the two leaders required.

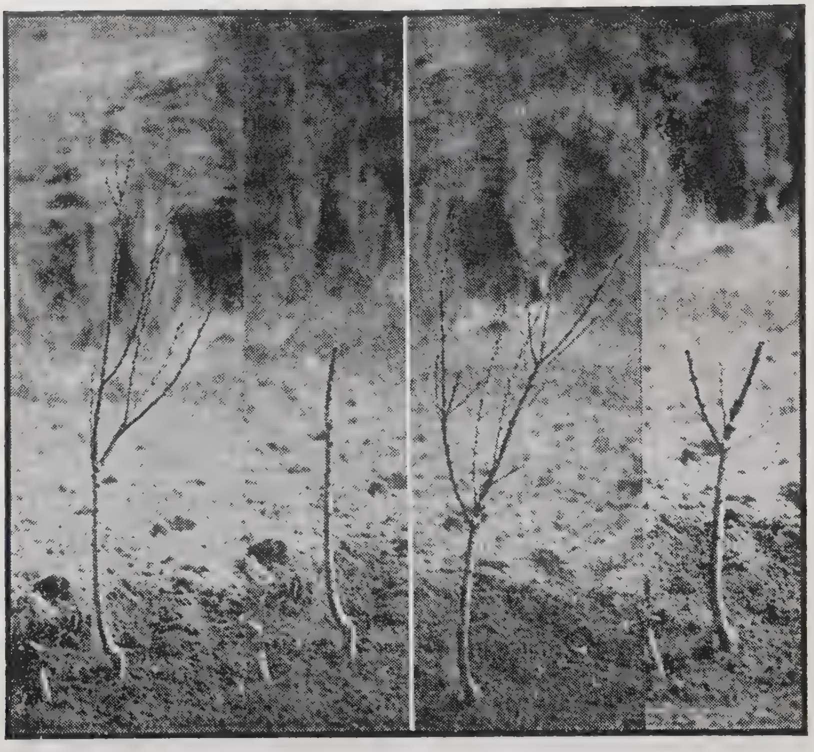
When a young tree is very unevenly balanced, for example, if it has one strong upright growth and two or three weak or horizontal growths, it should be cut back to a single rod and a fresh start made. The weak growths would never produce strong leaders, and the result of normal pruning on this type would be an unbalanced tree, with the original strong growth taking charge throughout its life. In cutting a tree back to a single rod care should be taken to cut to a position where the three top buds left are well spaced round the rod and not too close together.

The second winter's pruning is somewhat similar to the first pruning, except that it should not be necessary to cut back quite so hard, and the tree should have at least five or six good upright growths suitable for leaders. Every endeavour should be made to select growths which are spaced as evenly as possible round the tree. Five or six of the best growths should be pruned back to about half their length, again cutting to a bud facing in the direction in which it is desired to continue the leader. All other growths except these leaders should be removed during this second pruning.

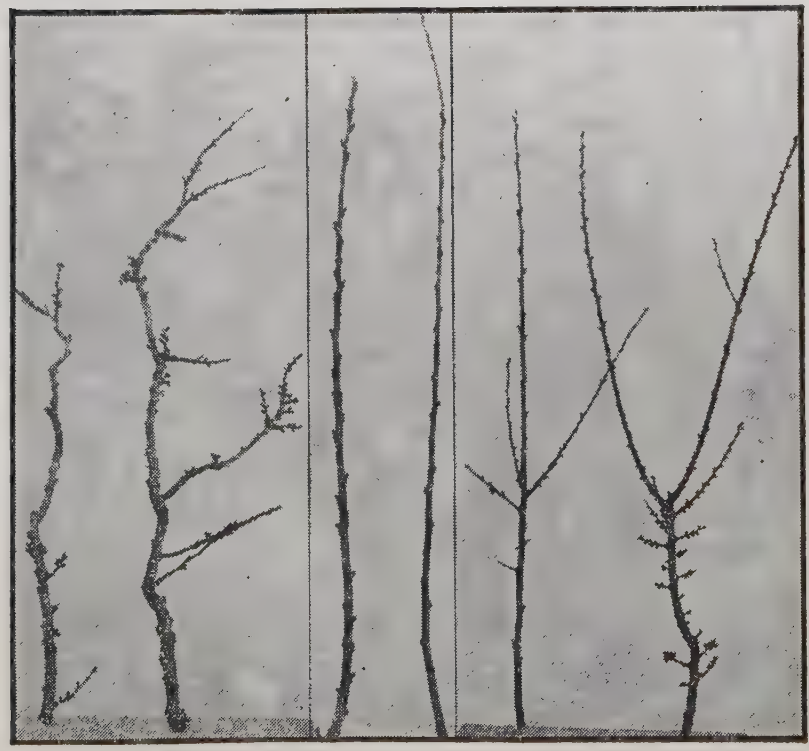
From the third winter onward no more leaders should be allowed to



Pruning of Trevatt apricot tree. Upper—Before pruning. Lower—After pruning.



Left—Badly shaped tree before and after pruning. Right—Well-balanced tree before and after pruning.



Left—Weakened fruiting wood. These growths should be cut back to the growth near the base. Middle—Mature shoot (left) and immature shoot (right). Right—Fruit spur development on immature shoot (left) and mature shoot (right).

develop. Five or six well-furnished ones are sufficient to form a complete circle. The leading growth of each should be cut back again to from a third to half its length and all competing growths removed. Some of the weaker shoots on the lower portions of the tree may be shortened back, or left unpruned if they are very short, to form temporary fruiting wood. From this stage onward the tree can be allowed to develop some fruiting wood, but the development of a strong framework must not be lost sight of, particularly during the next 4 or 5 years. As the leader extends in height strong fruiting arms should be encouraged to develop at 18in. to 2ft. apart up the leader. These arms when furnished with fruiting laterals considerably extend the bearing surface of the tree.

Pruning Bearing Trees

Most varieties of apricots are prolific bearers and set far more fruit than the tree can develop to a reasonable size and quality. During winter a considerable amount of thinning can be carried out by judicious pruning. This not only saves the grower time and expense by reducing hand thinning of fruit, but also assists the tree to maintain its vigour better. In localities where the frost risk is high, pruning should not be as hard as in frost-free areas. Trees hard pruned are more subject to loss of crop by frost than those which receive a lighter pruning, owing to the smaller amount of fruiting wood left in them and also to the fact that the blossoming period is considerably shortened after hard pruning. In districts or on varieties where the fruit set tends to be light, lighter pruning should be resorted to than where the fruit set is usually heavy.

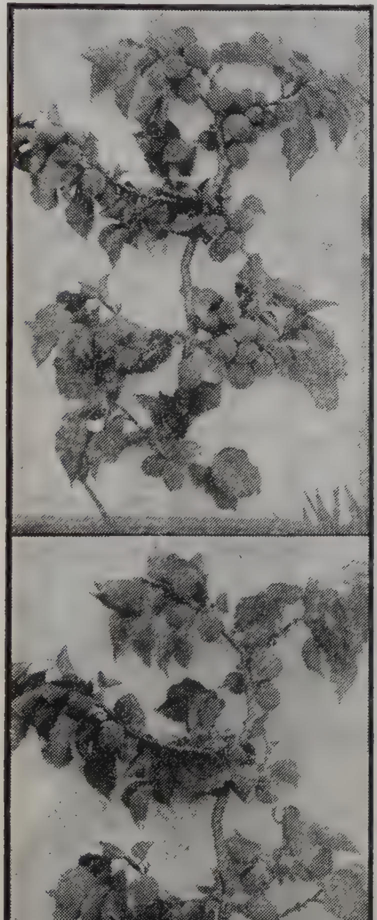
Fruit is borne mainly on short spurs which develop on 2-year-old and older wood and is also carried on 1-year-old wood. These fruiting spurs will continue to produce fruit for a number of years, but gradually weaken. They then produce small, low-quality fruit, so that a continuous renewal of the spurs is essential if fruit size and quality are to be maintained. On this page (bottom left) are shown weakened laterals on which most of the fruit spurs have died, thus leaving long lengths of bare, unfruitful wood. If these old worn-out laterals are cut back sufficiently hard, new shoots will develop and take their place; their removal should be spread over 2 or 3 years to avoid excessive reduction of crop in any one season. If more than one shoot develops, select the most mature one, cut it back to from a third of its length, and remove all others. A well-matured shoot can be distinguished readily by the mottled appearance of the wood and strong fruit-bud development. An immature shoot is reddish brown, lacks fruit-bud development and the mottled appearance, and does not develop fruit spurs to the same extent as one that is mature (see illustration at left). The difference in fruit spur development between a well-matured and an immature shoot is shown in the illustration at left. Sometimes it is necessary to leave immature growths for filling gaps in the tree, in which case they should be pruned hard back to try to force out fruiting spurs at the base of the growth.

Some varieties such as Montgamet, Roxburgh Red, and St. Ambroise require pruning in a different manner from such varieties as Moorpark, Trevatt, etc. The growth is much thinner, the tree is more spreading in habit, and fruit buds are not as pronounced as in other varieties. Shedding of fruit is usually fairly severe on these varieties. The method of pruning them is to thin out the growth and leave the smaller shoots of young wood uncut. If the young wood is cut, it will frequently die back to 2-year-old wood.

Dead or diseased twigs or laterals should be removed during pruning. All cuts made with the saw during pruning should be trimmed smooth and covered with a good tree-sealing compound as soon as possible after the cut is made to avoid infection by disease spores such as silver leaf.

Thinning

Under favourable conditions, apricot trees set far more fruit than they can develop to a reasonable size. Their habit of bearing in clusters hampers the control of insects such as leaf-roller caterpillars or earwigs, and diseases such as brown rot. A high proportion of small fruit, which is normally of low value, increases harvesting and packing costs, while overcropping causes a loss of vigour in the tree and a consequent reduction in yield for the ensuing year. Owing to their short stems, apricots in clusters tend to loosen and drop as they increase in size. For these reasons systematic thinning of the crop is essential.



Upper—Moorpark apricots before thinning. Lower—After thinning.

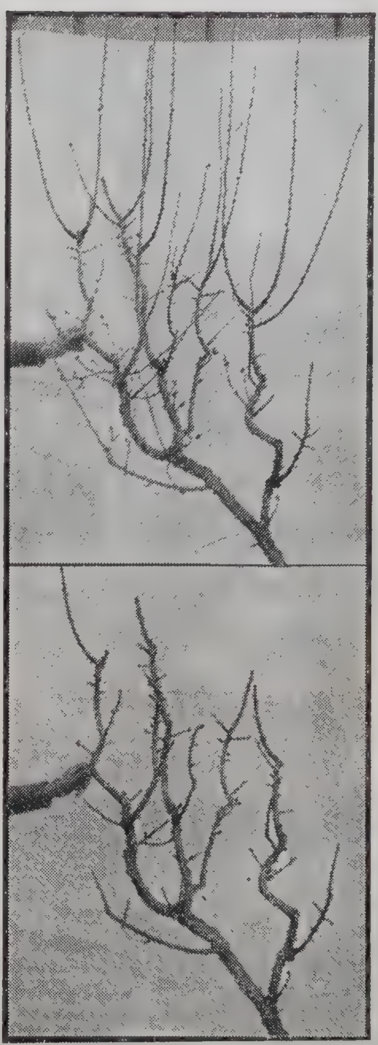
No definite guide can be given on how far apart the fruits should be spaced to secure the greatest advantage, though in general they should have enough room to grow to maturity without touching each other. Factors such as the vigour of the tree, condition of the foliage, and climatic conditions experienced during the growing season determine the quantity and quality of fruit that the tree can develop satisfactorily. The capacity of trees must be judged individually. Ideally, each tree should produce a full crop of good-quality fruit and at the same time develop sufficient growth and fruiting wood to maintain a vigorous, fruitful condition.

Thinning should be carried out as soon as possible after the risk of late frosts has passed. The earlier the crop can be safely thinned the greater is the benefit derived from it. In some apricot orchards growers begin thinning as soon as the fruit is large enough to handle. A variety such as Roxburgh Red, which normally continues to shed its fruit right through the season, should be left until the thinning of other varieties has been completed.

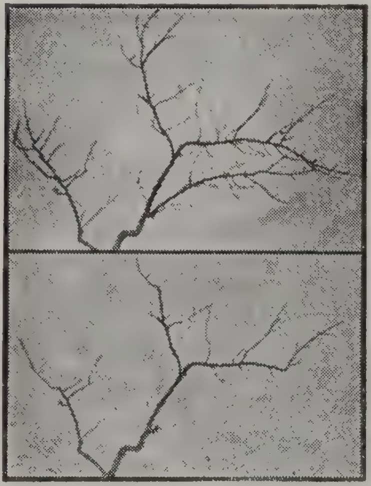
Harvesting

Three to 4 pickings at intervals of 5 to 7 days are necessary to harvest the fruit in the best possible condition. Fruits at the top and round the outside of the tree ripen considerably earlier than those in the centre or lower portions. The time it takes for fruit to reach the market after harvesting determines the stage of maturity at which it should be picked. Fruit intended for distant markets should be fully grown and just showing the first signs of colour at the apex. If the time between the dispatch of the fruit from the orchard and its arrival at the market is not more than 2 days, it should be harvested in a firm condition and have a reasonable amount of colour showing. Fruit should not be picked in an immature condition, as it is likely to shrivel, will not ripen properly, lacks flavour, and commands only low prices. The loss in the total number of cases which could be harvested can be considerable if the fruit is picked too soon, as the fruit increases in size very rapidly during the last few days before reaching full maturity.

Careful handling of the fruit is necessary at all times. Tin buckets holding from 14 to 18lb. of fruit and approximately 9in. square are usually used for harvesting. The picker hangs a bucket on a heavy leather belt round his waist or hangs it on a ladder or branch of a tree. Orchard boxes should not be too deep; 9in. is sufficient, especially for ripe fruit, otherwise bruising will be severe. Unless the boxes of picked fruit are carted to the packing shed as they are filled, they should be stacked on the south side of the trees out of the sun.



Upper—Branch of strong-growing Moorpark before pruning. Lower—After pruning.

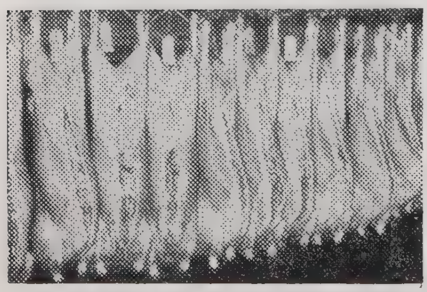


Upper—Branch of Roxburgh Red before pruning. Lower—After pruning.

DOUBLE TRIUMPH for

ELASTRATOR CASTRATION AND TAILING

at the Marlborough A. & P. Association, Picton.



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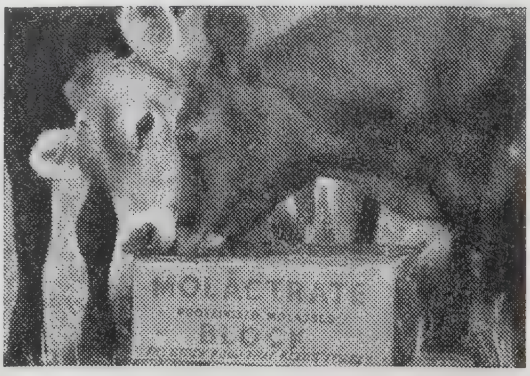

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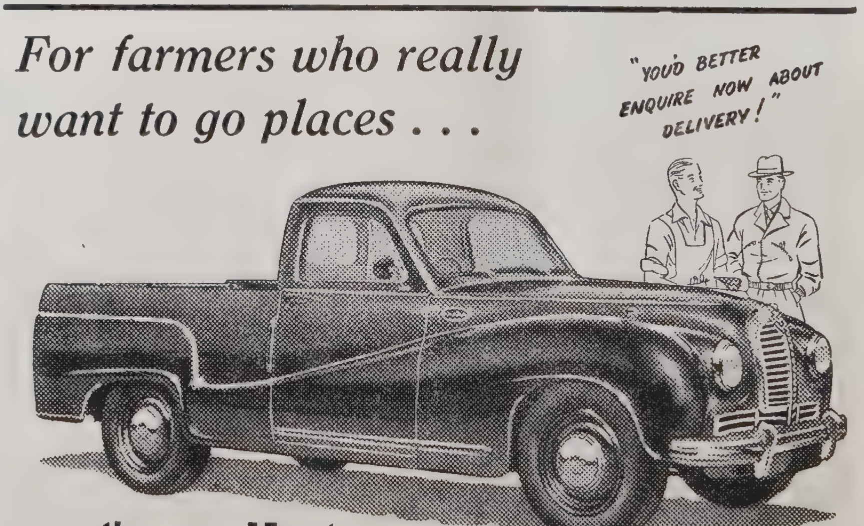
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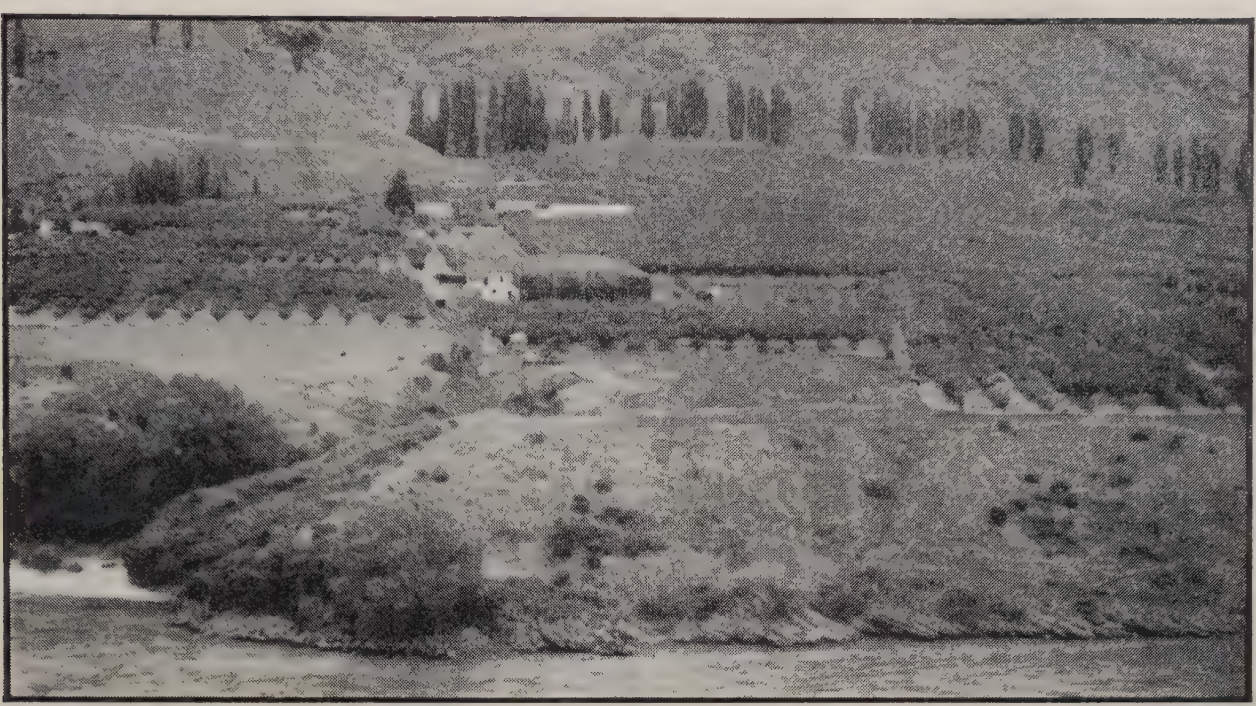

Stone fruit orchard in Central Otago.

Grading and Packing

Usually a machine is used for sizing the fruit in readiness for packing. A more even line in regard to maturity can be made if the fruit is put into three grades, fruit just showing colour for distant markets, that showing a reasonable amount of colour for close markets, and fruit which is firm ripe and suitable for jam or canning. The grading standards should be kept uniform from year to year so that buyers know when they see the label what quality article can be expected.

The majority of fruit marketed is packed into cases having an inside measurement of 7 x 7 x 18in. and holding approximately 18lb. of fruit. Some of the largest and choicest fruit is packed in trays lined with paper shavings; these trays are 11½ x 18in. inside and are 2½ to 3in. deep, holding one layer of fruit. In the standard half case (7in. x 7in. x 18in.) some growers pack all fruit over 1¾in. in diameter, using the diagonal pocket pack, and row in or jumble pack all smaller sizes. Other growers jumble pack the whole of the crop. It is an advantage to use the diagonal pocket pack for as much fruit as possible, as the fruit receives less bruising, travels well, and has a much better appearance when opened up on the markets. A sheet of thin, coloured or white paper specially made for the purpose is placed in the case before packing; this assists in stopping the chafing of the fruit on the sawn box timber and improves the finished pack.

Particulars of the contents, such as variety, grade, and grower's registered number, should be clearly marked on the label on one end of the case.

Cool Storage

The weather during the harvesting season for apricots is usually hot and the fruit ripens rapidly after picking; heavy losses can occur unless this fruit is placed on the market quickly. To retard ripening by lowering the temperature and to hold fruit during weekends and holiday periods many growers have constructed small automatic temperature-controlled cool stores on their orchards. A further advantage of these stores is that precooled fruit can be dispatched to distant markets in a more mature condition than uncooled fruit and still arrive in better condition.

The time that fruit is held in store depends on markets and availability of transport. It is seldom held in store for more than 2 weeks, and frequently is only placed in store for some hours at 35 degrees to 38 degrees F. to lower the flesh temperature of the fruit sufficiently to retard ripening.

Fungous Diseases

The main diseases for which spraying is recommended are:—

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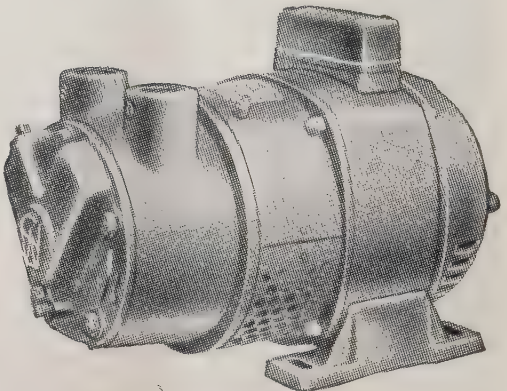

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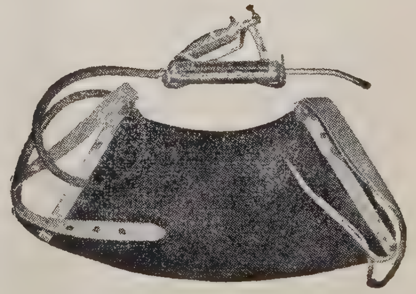

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Apricot trees coming into profit.

Brown rot (*Sclerotinia fructicola* (Wint.) Rehm) is the most serious fungous disease of apricots; it attacks blossoms, fruit, leaves, and shoots. Up to the present no spray has been found which will give complete control. Therefore every endeavour should be made to maintain cleanliness in the packing shed and orchard, thereby eliminating possible sources of carry-over infection of this disease.

The spread of brown rot is usually more severe during a wet spring, when blossom infection may become so general that the greater portion of the crop is lost. Infected blossoms turn brown and die and usually do not fall for some weeks. The fungus works down through the blossom into the base of the bud, where it forms a small canker. It is the gumming that occurs at this point that stops the dead blossom from falling. These small cankers sometimes continue to increase in size until they have completely girdled the shoot, which then rapidly wilts and dies.

Small, brown, more or less circular dead areas appear on the leaves after they have become infected. These dead areas may later fall away and leave the leaf with an appearance somewhat similar to that caused by shot-hole.

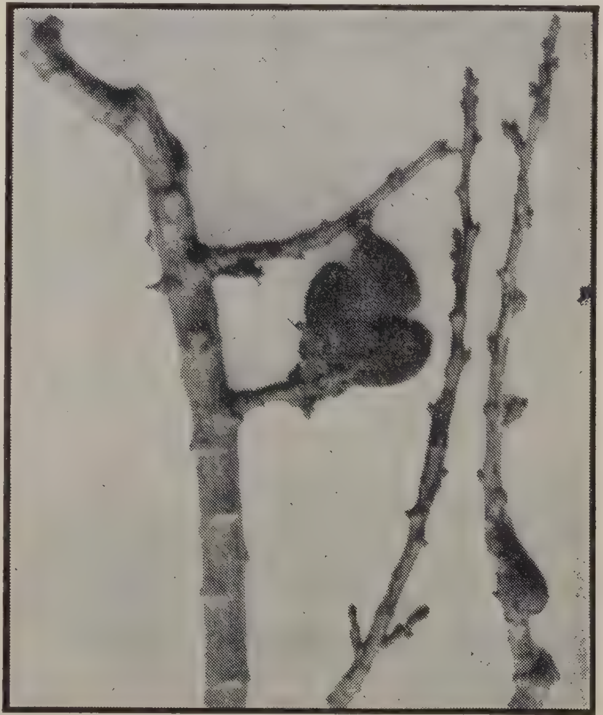
Fruit infection does not generally become very serious until the fruit is nearing maturity. The first sign of the disease on the fruit is the appearance of small brown areas. As the infection develops ashy-grey tufts of conidia appear on the infected surface and complete rotting of the fruit takes place within a few days of infection. The fruit at this stage appears as though covered with ashy-grey powder. If the affected fruit does not fall, it gradually becomes hardened and dries out and will hold on the tree throughout the winter. These fruits are known as mummies and act as a source of infection for the following season. Frequently the fungus works down from the fruit to the twig and gradually girdles it in the same manner as occurs in the blossom infection stage. Brown rot also travels from fruit to fruit if they are touching or hanging in clusters.

The crop should be thinned thoroughly so that as few fruits as possible are touching each other and picked and packed into clean cases to avoid as much as possible fruit becoming infected after dispatch from the orchard.

During pruning, brown rot cankered twigs and wood and mummied fruits should be cut out and destroyed by burning to eliminate sources of re-infection the following season.

To reduce the danger of infection from mummied fruit that may be left on the ground the soil should be cultivated after pruning is completed, but before the bud movement stage, and then left undisturbed until fruit set has taken place.

Die-back (*Clasterosporium carpophilum* (Lev.) Aderh.) occurs on fruit, leaves, and shoots, and where infection becomes severe it can cause heavy loss in returns by disfiguring



Brown rot of apricots. Mummied fruits on twigs on left and cankers on twigs on right.

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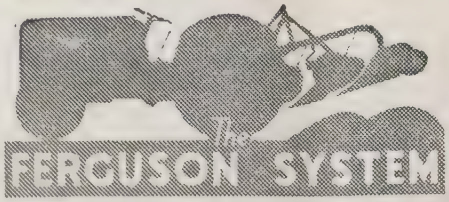

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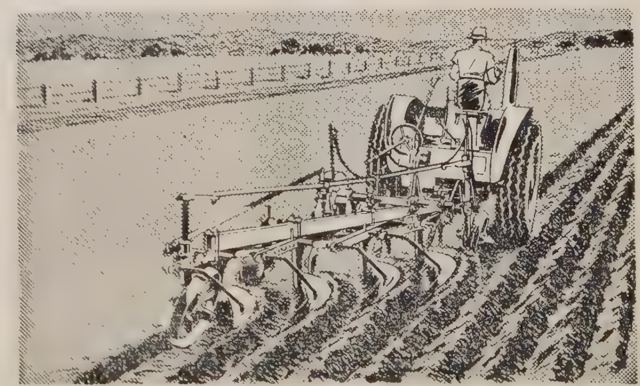

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the fruit and reducing its size. Its first appearance on the fruit is in the form of minute, purplish spots which later change to a light brown with a reddish margin. These spots give the fruit a distinct scabby appearance.

On the leaves the fungus first shows as circular, light-brown spots, surrounded by a darker margin. If the infection occurs early in the season, these spots fall away and give the leaf a shot-hole appearance, but if the infection occurs late in the season, the infected areas do not as a rule fall away. A severe infection frequently causes small fruit and poor growth, owing to the functions of the foliage being impaired.

When shoots become infected small, circular, slightly depressed cankers are formed first, which later become irregular in shape. As these areas increase in size they sometimes girdle the lateral, causing it to die back to the previous season's growth. The loss of fruiting wood caused by this disease can become serious if adequate control measures are not taken.

Peach scab (*Cladosporium carpophilum* Thuem.): Infected fruit has a low market value owing to its dingy and cracked appearance. This disease shows on the fruit in the form of minute, greenish, irregular spots, which become more regular in outline and darker as they develop in size. The infection is generally confined to the exposed or more coloured side of the fruit.

Infected foliage shows small, poorly defined spots, irregular in shape, and generally on the under surface. As these spots enlarge they become darker and more readily noticed owing to the development of yellow patches on surrounding portions of the leaf.

Trees infected with this disease are generally of poor appearance and may drop their foliage prematurely.

Shot-hole (*Phyllosticta prunicola* Sacc.) will attack fruit, leaves, and shoots of the apricot and causes a reduction in the value of the fruit and lower yields in the following seasons if the infection is not checked. The exposed or coloured surface of the fruit shows brightly coloured, small, circular, "scabbed" spots, which are very similar to the spots caused by die-back.

Small, circular, brown spots appear on the leaves, and these infected areas soon become brittle and fall away, giving the foliage a shot-hole appearance and affecting its natural functions. In severe cases the spots may coalesce and destroy most of the leaf surface, causing the production of small fruit and stunted tree growth.

The disease over-winters in fallen leaves, mummied fruit on the ground, and in infected shoots on the trees. Control measures consist of working the soil before the spring so that mummied fruits are buried and also by applying Bordeaux sprays.

Leaf curl (*Taphrina deformans* (Fcl.) Tul.): Although leaf curl is not usually serious in apricots, they become infected to some extent in some districts. Infection begins in early spring shortly after the unfolding of the leaves. The leaves become thickened and curled and young shoots swollen and distorted.

Leaf rust (*Puccinia pruni-spinosae* Pers.) on the fruit causes small, circular, depressed spots which become conspicuous as the fruit reaches maturity.

On the under surface of the leaves it forms small, bright-yellow areas, which are visible on the upper surface as discoloured, irregularly shaped spots. Rusty-brown spores of the fungi appear in the centre of the yellow areas. When the infection is severe it causes premature leaf fall. Leaves begin falling from the base of the shoot first and this falling continues upward until only a few leaves are left at the top. Leaf rust overwinters in bud scales, crevices on the bark, and on leaves lying on the surface of the soil.

Spray Programme

Apart from orchard hygiene, the main method of controlling the fungous diseases given is by the application of Bordeaux mixture sprays. Apricot foliage will not tolerate sulphur sprays, and if they are applied just before harvesting, they cause severe fruit drop.

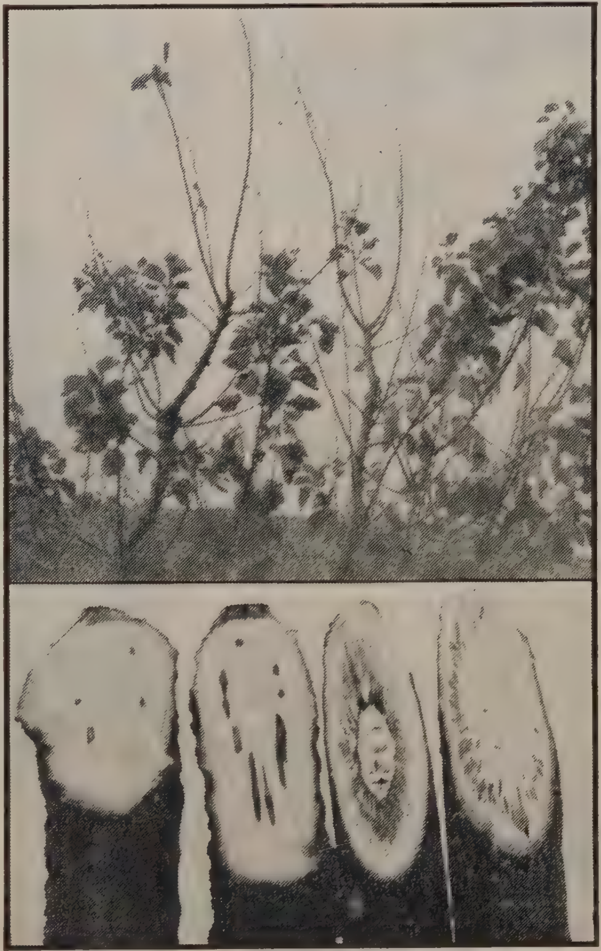
The first Bordeaux spray, at a strength of 5 : 4 : 50 (5lb. of copper sulphate and 4lb. of hydrated lime to 50 gallons of water) should be applied in spring at early bud movement of the leaf buds. If the weather favours the development of disease, particularly brown rot, or if the first spray has been applied too early, a further Bordeaux spray at a strength of 3 : 4 : 50 should be applied about 10 days later.

A further application of a 5 : 4 : 50 spray at the beginning of leaf fall in autumn is of great benefit in reducing the carry-over of disease to the following season.

Control depends largely on the efficiency with which sprays are applied. Correct time of application and complete coverage are essential. The spray plant should be overhauled during winter and tested in readiness for the spraying season. A hold-up for a week or so in the early stages due to faulty spray equipment could have serious consequences. A spray plant which will deliver at least 3 gallons per minute from each hose at a minimum pressure of 300lb. per square inch is necessary to do efficient spraying.

Cleanliness in and around the packing shed, cleaning orchard cases, and treating or destroying those which have had brown-rot infected fruit adhering to them also help to stop the spread of this disease. If second-hand cases are being used for packing, they should be inspected and any showing signs of having contained infected or rotten fruit should be disinfected. The following treatments are effective: Immerse the cases in a solution of copper sulphate 1lb. to 100 gallons, lime sulphur 1 gallon to 50 gallons, or formalin 1 gallon to 320 gallons. After dipping, cases must be allowed to dry before fruit is packed in them.

Silver leaf (*Stereum purpureum* Pers.) is a serious fungous disease in most stone fruit growing areas in New Zealand and is causing numbers of trees to die each year. This disease attacks many different kinds of trees and shrubs, including willows, poplars, and silver birch, which are used by many orchardists as shelter belts. Any grower experiencing severe losses of fruit trees with silver leaf disease should look to surrounding



Upper—Apricot tree 11 years old infected with verticillium wilt.
Lower—Apricot branches cut across to show black discoloration caused by verticillium wilt.

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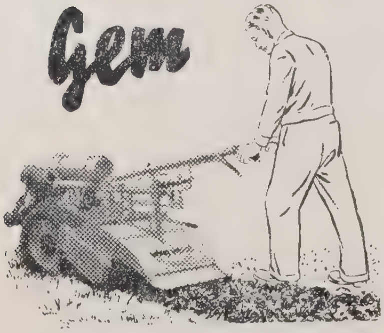

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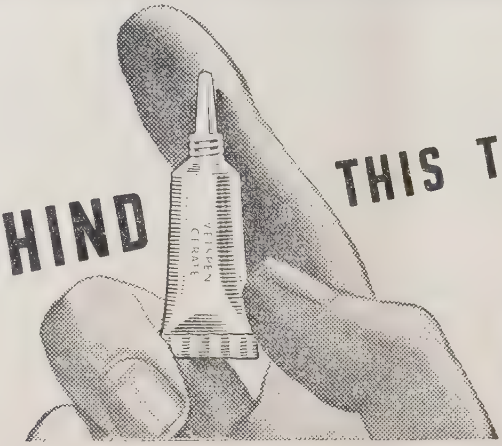

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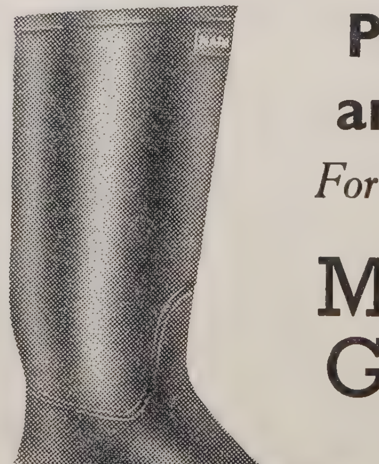

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hedges or shelter belts for possible sources of infection.

The first indication of its presence is the silvering of the foliage, followed by decline in vigour, and finally death of the affected branch or whole tree. After the disease has killed the wood, fructifications of the fungus appear. These are flat, more or less semi-circular in shape, and range from white through salmon pink to purple.

Control measures consist of cleaning up all likely sources of infection, the removal and burning of infected branches and trees in summer, and covering all saw pruning cuts with a good wound sealing compound as soon as possible after the cut has been made.

Verticillium wilt is caused by *Verticillium dahliae* Kleb., a fungous disease which is soil borne and travels up through the branches in the wood. It is common on tomatoes and potatoes and in each instance where it has been found on apricots, tomatoes have either been grown before the planting of apricots or between the rows.

The first indication of the disease in apricots is yellowing of the foliage on lower portions of the young wood. This affected foliage then drops, leaving bare wood. When the wood is cut it shows discoloration; the wood is light brown at the tops and gets increasingly darker in the older wood.

There is no means of eradicating wilt once it has become established in a tree. If the trees are only slightly affected and it is intended to retain them, they should be pruned and manured lightly so that the development of vigorous growth is not caused.

Intercropping of blocks of apricot trees with such plants as tomatoes, potatoes, or strawberries should be avoided, as these plants can cause a rapid build-up of the fungus if it is present in the soil.

Where wilt is known to exist weeds such as fat-hen (*Chenopodium album*), black nightshade (*Solanum nigrum*), wild tomato (*Solanum* sp.), mallow (*Malva rotundifolia*), and wild turnip (*Sinapis arvensis*) should not be allowed to grow, as they are subject to attack by verticillium wilt and could be the means of increasing the spread of the disease.

The moving of tractors and cultivation implements from areas used for tomato or potato production to young apricot orchards tends to spread infection by transference of soil.

Non-susceptible cover crops such as cereals, grasses, or clovers should be sown annually to maintain the humus content of the soil.

Where an apricot tree has been removed owing to wilt the space should be left for 2 or 3 years before another tree is planted, unless the site is sterilised. Thorough disinfection of the tree site with either chloropicrin or formalin before planting will eradicate the disease from the soil.

Valsa injury (*Valsa leucostoma* (Pers.) Fr.) is first noticed when the foliage wilts, turns brown, and falls from a lateral or branch during the growing season, thus leaving it bare. Gumming begins at or before the wilting stage and usually occurs at the junction of the dead and live wood. The bark becomes brightly coloured and shrinks on laterals killed by the fungus, while on older branches and limbs a crevice develops between the living and dead wood.

Control measures consist of removing dead wood and covering the wounds with a good sealing compound.

Crown gall or root knot (*Phytomonas tumefaciens* (Sm. and Townsd.) Comm. S.A.B.) is a bacterial disease and is confined to the rooting system and crown of the tree. This disease causes wart-like growths to form on the roots, and it is very seldom that trees become infected once they have passed the seedling stage. Any young trees that show this trouble should not be planted in the orchard, but should be returned to the vender.

Insect Pests

San Jose scale (*Aspidiotus perniciosus*) is the most serious of scale insects affecting fruit trees. The mature scales are greyish, circular in outline, and slightly dome shaped.

The scale causes reddish discolorations of the wood and pinkish rings surrounding them on the fruit. Once established they multiply very rapidly and can cause stunting or even the death of trees by sucking the sap from the branches.

Mussel scale (*Lepidosaphes ulmi*) can be distinguished readily by its shape, which is similar to the shell of the salt-water mussel. It is greyish brown and about ⅛in. long. The scale attacks branches, young shoots, and fruits, and like the San Jose scale feeds on the sap sucked from the tree parts. It multiplies rapidly and if not controlled, can cause stunting of the tree as well as spoiling the appearance of the fruit.

Both San Jose and mussel scales can be controlled by the application of a 5 per cent. winter oil during the dormant stage of tree growth.

Leaf-roller caterpillars (*Tortrix* sp.) are small greenish caterpillars which feed under cover of leaves that have been tied together by silken threads they have spun, or in clusters of fruit. They cause damage by chewing the skin of the fruit, making it unsaleable.

This insect is controlled by the application of basic lead arsenate at the rate of 1½lb. per 100 gallons plus 3lb. of hydrated lime. Good control has also been obtained with the use of from 1 to 1½lb. of 50 per cent. D.D.D. per 100 gallons of water.

Earwigs (*Forficula auricularia*) become a serious pest in some seasons to apricot growers in Central Otago. During the winter these insects lie underground. The eggs hatch in spring, and the young earwigs emerge from the soil to feed on the pollen and pistils of flowers, and as they grow in size they feed on fruits. They are nocturnal in habit, taking shelter under stones, boards, etc., or even burrowing into the soil during the day and feeding at night.

Poisoning is the best means of eradicating this pest. A poison bait which has been used very successfully in Otago is made by mixing 6lb. of bran, 2 quarts of water, 2lb. of treacle, and 6oz. of sodium fluoride. Dissolve the sodium fluoride in water, pour the treacle in, and stir in the bran. The addition of a little glycerine to the mixture makes it keep moist longer.

The bait should be distributed in the evening, a small handful being placed firmly in each tree fork.

Better control is secured if all growers in a locality poison at the same time. Generally one baiting is sufficient to give control unless heavy rain is experienced, when baits may have to be renewed.

Deficiency Diseases or Disorders

Deficiency diseases are due to an unbalanced plant food supply or shortage of a particular element in the soil and can generally be overcome by supplying the element that is lacking. Sometimes a deficiency is caused by over-liming, while on the other hand some deficiencies can be due to a shortage of lime. A deficiency trouble generally has a debilitating effect on tree growth and it should be remedied as soon as possible. Every care should be taken to see that the correct diagnosis is secured and that excess quantities of the deficient element, particularly the minor elements, are not applied.

Boron deficiency causes a browning of the flesh of apricots. In mild cases only the stem end is affected, but in more severe cases this brown spotting may extend almost the full length of the fruit, being most obvious near the stone. A dry, spongy condition of the flesh near the stone is also sometimes seen. Badly affected fruit is valueless.

Control can be secured by applying in early spring ½lb. of borax per tree as a soil dressing. This should be sufficient for 3 years. Another method, which will give control for one season, is to apply a spray of 0.1 per cent. hydrated borax (1lb. to 100 gallons of water) in spring as soon as the tree has developed sufficient foliage to take up the material.

Manganese deficiency shows as a yellowing between the veins of the leaves, and can be rectified by the application of a spray containing 3lb. of manganese sulphate, and 4lb. of hydrated lime to 50 gallons of water when the tree is in full foliage.

It is only very recently that apricot trees have been found affected with virus diseases, and at present little is known about them; they are being investigated by research workers, but no method of control is known.

Virus diseases live within the plant, and can be transmitted from tree to tree by budding, so that growers who raise their own trees should ensure that their source of budwood is healthy. Plum mosaic is the most common virus observed on apricots. The symptoms on the foliage are a mosaic mottling or an oak-leaf pattern, and are light green to yellowish, though sometimes a distinct yellow to light-brown band may show across the leaf. Stunting of growth and reduced crops occur on badly affected trees.

References

"Fungous Diseases of Fruit Trees", G. H. Cunningham; "Deciduous Orchards", W. H. Chandler; and "Verticillium Wilt of Apricot, Gooseberry, Strawberry, and Tomato", "The New Zealand Journal of Agriculture", August 1951, p. 129, H. C. Smith.

Circular Saws are Dangerous when Run at too High Speeds

By H. W. T. EGGERS, Engineer, Department of Agriculture, Wellington

WITH the approach of winter many farmers are now likely to be using circular saws to cut up firewood. Saws can be very dangerous if travelling at too high speeds, especially if over-powered when being driven from the power take-off pulleys on tractors. This article deals with the correct speeds at which saws should run and explains how those speeds can be obtained.

A CIRCULAR saw, whether crosscut or rip, does its cutting by the removal by each tooth of the fibrous matter with which it comes in contact. The teeth of that segment of the saw which is in the wood carry the full cutting resistance, which is in turn transmitted to the saw spindle through the blade.

As only a small segment of the saw is in the wood at one time and the position of this segment in relation to the saw blade is constantly and rapidly changing, each part of the saw blade is subject to an extremely rapid alternation of stresses.

These working stresses are not the only ones to which the saw blade is subjected. Centrifugal force set up by the speed of rotation produces stresses which exert a bursting effect on the blade. These stresses are considerable at very high speeds and when coupled with the rapid alternation of working stresses may be sufficient to cause the saw blade to fracture, with disastrous results to the operator.

Operating a circular saw at too high a speed also causes the cutting edges of the teeth to heat and lose their keenness, thereby increasing cutting resistance and throwing a greater load on the saw.

Saws are designed to operate at a peripheral speed which will give the most effective cutting action and maintain economic periods between re-sharpening; in addition there must be a reasonable factor of safety in operation. The grade of steel, thickness of saw, the tooth form, and the speed of rotation are all factors which are considered by manufacturers when saws are designed.

Most circular saws are designed to run at a peripheral speed (the speed of the outer rim of the saw) of about 9000ft. per minute, and speeds above this figure subject them to undue stresses. The following table, based on the peripheral speed given above, gives the spindle speeds for saws of various diameters:—

Diameter of saw in.	Spindle speed r.p.m.
6	5730
10	3450
12	2860
15	2290
18	1910
21	1630
24	1500
25	1400
26	1350
27	1300
28	1270
29	1230
30	1200

Most tractor power take-off pulleys revolve at 500 to 600 r.p.m. and to produce the correct spindle speed the pulley on a saw bench driven by a tractor has to be proportionate in diameter to the power take-off pulley.

The correct sizes of pulleys to use on both the tractor and saw bench can be easily calculated, as the spindle speeds are in inverse ratio to the pulley diameters. The size of saw bench pulley required to give the correct saw spindle speed is found by dividing the saw spindle speed into the product of the tractor pulley's diameter in inches and its speed. For example, the diameter of the saw spindle pulley to give a spindle speed of 1000 r.p.m. when the power take-off pulley is 10in. in diameter and its speed is 500 r.p.m. would be:—

$$\frac{10 \times 500}{1000} = 5\text{in.}$$

☆

Nitrogenous Fertilisers for Out-of-season Growth of Pastures

SEVERAL considerations govern the use of nitrogenous fertilisers for the production of out-of-season grass. Though practically every class of sward responds to nitrogen by turning a darker green, sufficient extra grass production to cover the costs of treatment can be secured only from high-class swards containing pasture species capable of giving extra growth at the required time. Short-rotation ryegrass is particularly valuable in this respect. As its normal producing period is late winter and early spring, this grass will frequently give marked production increases as a result of nitrogenous fertilisers applied at that time.

If possible, nitrogen topdressing should be applied when the sward is showing some growth. Application during cold or frosty weather may give disappointing results. The area should have had adequate phosphatic manuring and, where necessary, have received lime and potash as well. The field must be well drained so that stock can be carried on it to use the extra grass when it is produced; growing extra out-of-season feed is useless unless it is used at that time.

To sum up, nitrogenous fertilisers for out-of-season grass should be applied during "growthy" weather, about a month or 6 weeks in advance of the time feed is required, to well-fertilised and well-drained pastures composed of high-producing pasture species capable of giving marked production responses to the applied nitrogen.

—*P. B. LYNCH,*
Crop Experimentalist,
Department of Agriculture,
Wellington

☆

Chemical Control of Willows

TO control willows by chemical methods different treatments are required at three stages of growth. Suckers and seedlings up to 6ft. high are most efficiently killed by an over-all spray of 1 to 2lb. of an oil-based ester of 2,4-D in 100 gallons of water applied in summer when the leaves are fully developed. A complete foliage cover is essential.

For young trees with smooth bark at the base of the trunk 1lb. acid equivalent of an oil-based ester of 2,4-D is diluted with 20 gallons of dieselene and applied to an area twice the diameter of the tree from ground level upward. The time of application is relatively unimportant, but the best results are obtained if the treatment is carried out in the dormant season.

Old trees with thick, roughened bark at the base of the trunk should have the bark removed to expose the wood before the hormone-dieselene mixture is applied. This operation of frilling is best done with a plastic detonating fuse containing an explosive charge. If an axe is used, care should be taken not to damage the underlying wood. One pound acid equivalent of an oil-based ester of 2,4-D in 5 gallons of dieselene forms a suitable mixture to apply to the frill.

Alternative methods of control are the over-all spraying of trees and the cut-stump method. For the cut-stump method the preparation of hormone and dieselene is applied to the tops and sides of the stump shortly after felling. Adjoining suckers should also be treated.

—*L. J. MATTHEWS,*
Weeds Research Officer,
Department of Agriculture,
Wellington

◆

Control of Tall Fescue on Roadsides and Stopbanks

PERMANENT eradication of tall fescue from pastures on alluvial flats is impossible where roadsides, stopbanks, and drain banks remain a source of reinfestation. The value of *Phalaris tuberosa* as a means of controlling tall fescue on roadsides and stopbanks is well demonstrated on the Hauraki Plains. Where *Phalaris tuberosa* is allowed to grow unchecked by stock it will within a relatively short time suppress and finally eradicate the fescue. Establishment of *Phalaris tuberosa* on a properly prepared seed-bed gives the quickest results, but the grass will spread by seeding from a few plants transplanted out among the fescue. It is not a case of one menace being replaced by another since *Phalaris tuberosa,* unlike tall fescue, is non-poisonous to stock and is a very valuable species in a pasture. Because of its high palatability, however, stock will prevent its spreading beyond the fenceline.

—*G. L. BANFIELD,*
Instructor in Agriculture,
Department of Agriculture,
Thames

◆

Chemical Methods of Weed Control

IN the first part of this article in the April issue of the "Journal" L. J. Matthews, Weeds Research Officer, Department of Agriculture, Wellington, gave information on chemical methods of weed control obtained from trials conducted by the Extension Division of the Department, including advice on the most effective chemical for different weed species and a useful description of the groupings of the various preparations. This second and concluding part deals with control of grass weeds, woody perennials, and weeds in crops.

THE hormone weedkillers have proved the most useful for controlling scrub weeds such as blackberry, willow, and gorse.

SCRUB WEEDS

Usually scrub or brush weeds are destroyed most effectively by preparations of 2,4,5-T. Complete spray cover of the plant is very important. Volatile esters aid in securing over-all spray cover, but even these materials must be applied thoroughly for good results. A second spraying by spot treatment of any green areas that are missed in the first operation is often advisable 2 months later. Applications should be made in the young stages of growth, as resistance increases with maturity. Specific treatments for certain plants follow.

Blackberry

Preparations of 2,4,5-T have proved the most effective chemical means of controlling blackberry. When 2,4,5-T is to be used blackberry can be considered in two growth stages, as first-year canes and as second-year canes.

First-year canes may arise following burning or cutting or from spray treatments. In trial work the best control has been secured with the amine salt of 2,4,5-T, and, although trials have not been completed, it is considered that the water-based esters of 2,4,5-T are also likely to give good results. The oil-based esters tend to cause a rapid kill of young canes to ground level, followed by strong regrowths a few months later, except where early-autumn applications have been made.

Second-year canes: In established plants both first- and second-year canes are present. The foliage of second-year canes repels the water-based amine salts. Esters are therefore required, and the new water-based esters, because they are translocated more than the oil-based esters, may prove efficient for the control of blackberry.

Factors Affecting Control

The following matters have to be considered in the control of blackberry with chemicals:—

Time of Application

The time of application of the chemical is very important. The best periods are summer and early autumn. Plants should be in full leaf and second-year canes should be fruiting or past fruiting. Spring application results in a poor foliage and cane check, with strong regrowths later appearing from the base of the crown or from laterally growing roots. The late-autumn and winter applications require excessive rates to secure a foliage and cane check. Because there is little food movement once the plants are largely defoliated by frosts, only a contact kill is possible and there is much subsequent regrowth.

Rates of Application

In summer and early autumn 3 to 4lb. of acid equivalent per acre is sufficient for control. To secure a slow kill of foliage and canes the rate should be varied for different districts. Normally, the slower the foliage and cane check to ground level the fewer the regrowths. A quick check, resulting from an application in December or January of excessive amounts of oil-based esters, usually results in strong regrowths in early autumn. A slow cane check takes up to several months to reach ground level. Lower rates of applications will be necessary for northern areas and higher rates for most South Island districts.

Cover or Spray Distribution

Trials have shown that sufficient spray can be taken in by the leaves of blackberry for control to be obtained, as is shown by the results obtained with the amine salts of 2,4,5-T, which are repelled by the waxy surface of the canes. The canes' cylindrical nature makes them difficult to wet. Consequently, a fine spray should be used so that the spray particles have a better chance of adhering to canes if they are driven past the foliage.

For small first-year canes 60 gallons of water per acre is sufficient with low-volume nozzles to obtain an adequate cover. For "old man" blackberry up to 100 gallons of water per acre is necessary to secure a complete foliage cover. Where first-year canes arise from cutting or rolling operations boom spraying may be feasible.

Carrier or Spreader for 2,4,5-T

Water is the best carrier for 2,4,5-T. Kerosene, dieselene, or other aromatic oils hasten the foliage check, and this results in more regrowths. In the stump method 2,4,5-T ester can be used with these oils, though they have not proved very satisfactory, in a 1 : 10 solution painted on the stump immediately after the plant has been cut down. Another alternative, not yet proved by trial work, is to apply a strong solution of 2,4,5-T and oil in the dormant season to the canes of blackberry. The rate should be 3 to 4lb. of acid equivalent in 5 gallons of oil per acre. This method would be more expensive than that in which water is used in summer or early autumn.

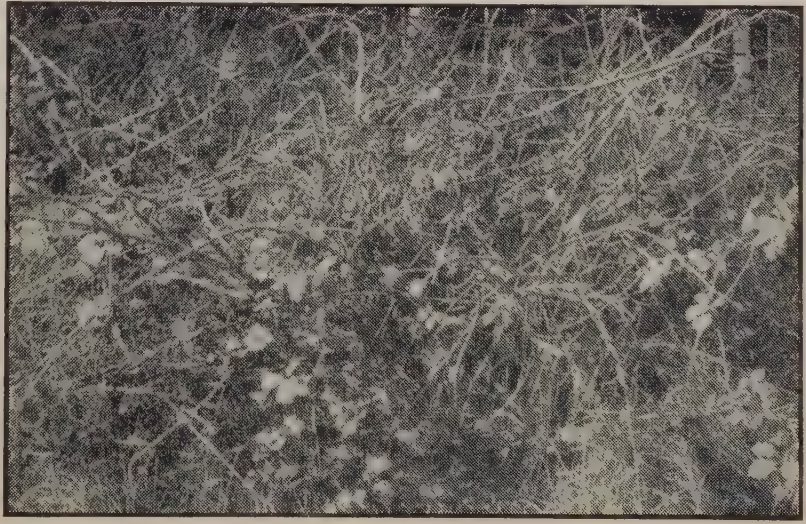
Formulations

No difference has been detected between volatile and non-volatile preparations of 2,4,5-T. Foliage cover is not nearly so important for blackberry as for some other scrub species such as gorse, manuka, or tauhinu. The water-based esters may prove valuable for regrowths and first-year canes.

Mixtures of 2,4-D and 2,4,5-T depend on the 2,4,5-T content for efficient control of blackberry, and as the 2,4-D is unnecessary, these mixtures are not recommended.

Treatment of Regrowths

Regrowths should be allowed to grow for 1 year and should then be treated in summer and early autumn after the leaves are fully grown. The best results are obtained if a water-based material is used. A third application is probably necessary for eradication.



Regrowths of blackberry following a spring application of an oil-based ester. The foliage kill was too rapid for extensive root damage.

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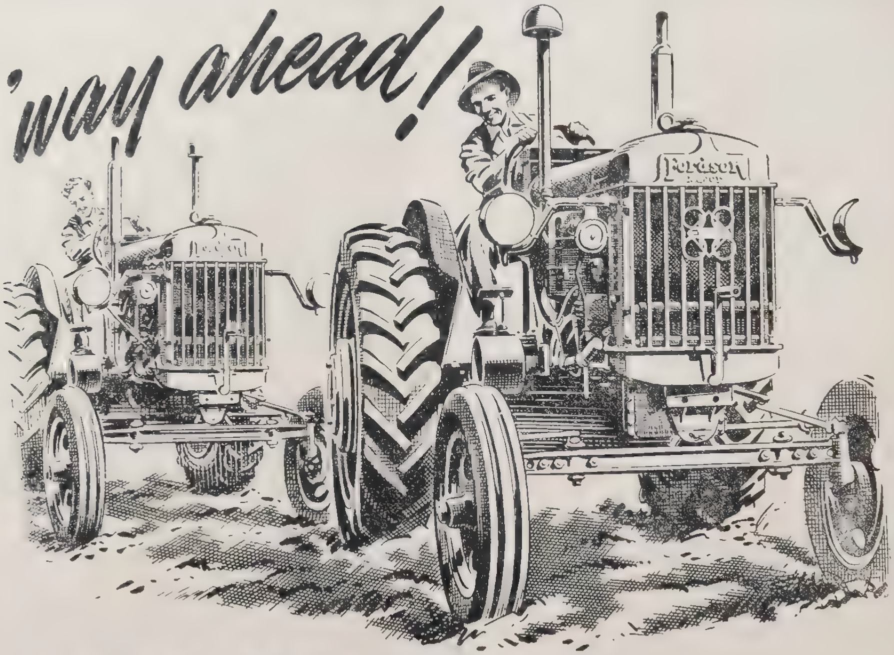

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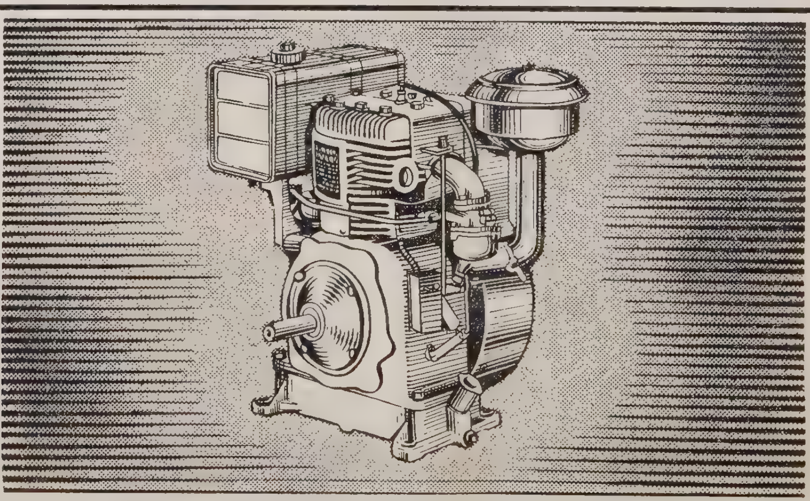

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Gorse

For the control of gorse with 2,4,5-T preparations treatment in the different growth stages is as follows:—

Seedling gorse past the true seed-leaf stage is killed very readily with the oil-based 2,4,5-T preparations at rates of 1 to 2lb. of acid equivalent per acre.

Regrowth gorse from 1 to 3ft. high: Although gorse of this nature is just as susceptible as seedling gorse to oil-based esters of 2,4,5-T, greater care is required to obtain good kills. The rates of application are the same as for seedling gorse, but if the application is made too soon after burning or cutting, poor results occur. The gorse should be at least 12in. high and a complete foliage or stem cover is essential.

Gorse with green stems 3 to 5ft. high: At this stage gorse is not controlled easily with hormones of 2,4,5-T base. Although it is susceptible to oil-based esters of 2,4,5-T at 3 to 4lb. of acid equivalent per acre, factors such as the necessity of securing a complete foliage and stem cover and of obtaining access through compacted clumps make control very difficult. Isolated bushes or small clumps that can be covered properly are easily killed.

"Old man" gorse with brown bark on the stems is susceptible to oil-based esters of 2,4,5-T at rates of over 4lb. of acid equivalent per acre, but repeat applications are necessary for eradication. Complete foliage cover is very difficult to obtain, and gorse with mature bark is able to send forth new growth from the stem.

Gorse over 3 to 4ft. high is best burnt or cut, and the regrowths treated as described; alternatively such gorse should be cut and a solution of an oil-based ester and dieselene or kerosene applied to the freshly cut surfaces of the stumps. The plants should be cut as close to the ground as possible; if this is not done, the bark should be peeled back on stumps over 3 to 4in. high. One pound of acid equivalent of 2,4,5-T in 10 to 15 gallons of dieselene forms a suitable solution.

Factors Affecting Control

Factors to be considered for controlling gorse with 2,4,5-T are as follows:—

Time and Rates of Application

Before flowering, seedling gorse may be destroyed from October to March inclusive with chemical applied at a rate of 2lb. of acid equivalent per acre. In northern districts the rate may be lowered, particularly on a hot day. From the middle of December to February the rate can be lowered to 1lb. of acid equivalent per acre. Regrowth gorse is best treated from the middle of December to late February, when the new season's growth has fully formed and food is being taken into the roots. In these months also the plants are not in heavy flower; this is important, as the flowers tend to absorb spray and then drop off, poor control resulting. The stump treatment may be carried out at any time of the year.

Old man gorse in heavy flower shows great resistance to the oil-based esters in late autumn and winter. Poor results can also be expected if regrowth gorse is treated in adverse conditions, for example, cold, wet soils and low temperatures.

This gorse bush was not sprayed completely, with the result that the branch on the left is still alive. Complete coverage of gorse bushes is important.

Cover or Spray Distribution

A complete foliage and stem cover is essential, particularly for regrowth and older gorse. Unless the whole plant is completely covered, the unsprayed area will throw out shoots. Boom spraying is satisfactory for short gorse provided a large volume of water is used.

To ensure a complete kill in one season a follow-up spray of the green areas of the plant, that is, of parts missed in the first operation, should be made about 2 months later.

Carrier or Spreader for 2,4,5-T

As for the treatment of blackberry the most effective carrier for 2,4,5-T in the treatment of gorse is water, except for the stump treatment. If aromatic oils such as dieselene or kerosene are used in spraying other than seedling gorse, a quick scorching of the foliage occurs with resultant rapid recovery. For regrowths or established gorse a slow foliage check is required for positive control. On the other hand, kerosene or dieselene used as a carrier and penetrant in the stump method has given excellent results.

Formulations

Best results have been secured with volatile esters of 2,4,5-T such as the butyl ester, especially when applied on a hot, still day. This is due to the toxic vapours assisting the spray cover. Non-volatile oil-based esters of 2,4,5-T have given equal results where spray distribution has been complete. The 2,4-D esters fail to control gorse, and mixtures of 2,4-D and 2,4,5-T are not recommended for gorse control, as the efficiency of such preparations depends on the 2,4,5-T content.

Willows

Preparations of 2,4-D rather than 2,4,5-T have given effective willow control. For control willows may be considered at the following three stages of growth.

Seedlings and suckers up to 5ft. are eradicated best by an over-all spray of 2,4-D oil-based ester and water applied in summer at a concentration of 1000 to 2000 parts per million (1 to 2lb. of acid equivalent in 100 gallons of water). A complete spray cover is essential. Inferior results are obtained, especially with regrowths or suckers, if the spraying is done in spring when leaf growth is not fully expanded; a foliage check is secured, but further growth occurs later.

Willows with smooth green bark at the base of the bole are controlled most effectively by a basal application of a mixture of 2,4-D oil-based ester and dieselene to an area twice the diameter of the tree from ground level upward. A suitable concentration is 1lb. of acid equivalent of 2,4-D oil-based ester in 10 to 20 gallons of dieselene. From 2 to 3 fl. oz. should be applied to a tree 2 to 3in. in diameter. Care should be taken to ring the tree completely on green bark, as poor control results if, when spraying is done, dead wood on part of the bole is treated. Once the trees have developed thick, corky bark the hormone-dieselene mixture fails to penetrate and control is not secured. The method to be employed for such trees is described here.

Willows with mature, corky bark at the base of the bole: For securing entry of the hormone into this type of tree the thick, corky bark must first be removed. This operation of frilling has been executed successfully by winding a plastic detonating fuse containing an explosive charge round the tree 1 to 3ft. from the ground and detonating it. The underlying wood is exposed but not damaged and the bark is pulverised into spongy tissue which readily absorbs the hormone-dieselene mixture. If an axe is used, care should be taken not to damage the underlying wood; the cut must be V shaped and horizontal to hold the weedkilling preparation. With an axe difficulty is experienced in frilling leaning trees. In all cases the frill must encircle the tree completely and must be on green wood. A preparation of 1lb. of acid equivalent of an oil-based ester of 2,4-D in 5 gallons of dieselene is suitable.

Alternative methods of control are the over-all spraying of trees and the stump method. The first is costly and great care is needed to secure the

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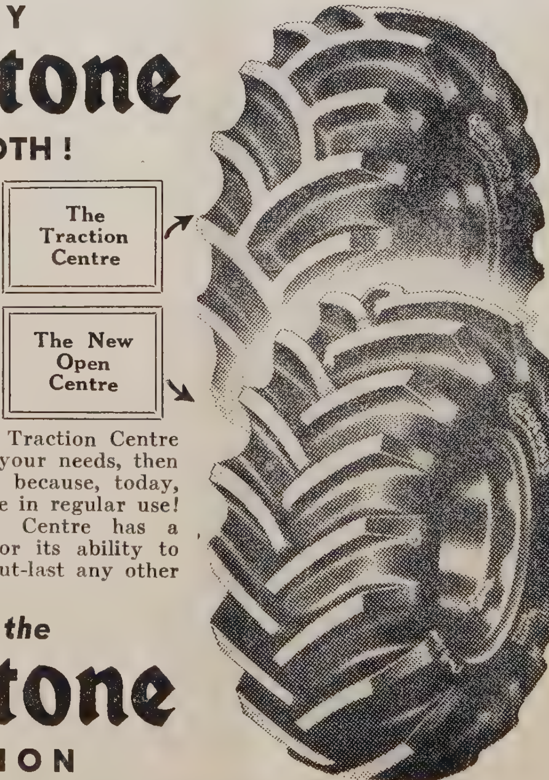

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Control of goat's rue. Left—Growth such as this is destroyed effectively with esters of 2,4,5-T. Right—An area along a fence cleared of goat's rue after a summer application of an ester of 2,4,5-T and water (left) compared with an untreated area (right).

over-all foliage cover. The concentration is that used for suckers and seedlings, but a larger quantity of material per acre is required. In the stump method an oil-based ester of 2,4-D of 1lb. of acid equivalent in 10 to 20 gallons of dieselene is applied to the freshly cut surface and the sides of the stump. Where possible the plants should be cut off close to the ground; if that is not possible for mature trees, the bark should be stripped back. Individual suckers should also be treated.

Factors Affecting Control

Factors that affect the efficiency of control of willows with 2,4-D are as follows:—

Time and Rates of Application

The best results from over-all spraying of willows are obtained in summer. Spring spraying results in further shooting and recovery. Bole applications and stump treatments may be carried out at any time, although possibly applications in the dormant season are best; trees treated in the dormant season burst into leaf as normally, but die later; death results after 6 to 12 months. As for most weed species the rates of application may be reduced in northern districts for the over-all spray methods.

Cover or Spray Distribution

Complete spray cover is very important, and if this is not obtained and there is not a complete kill, a follow-up spray is necessary 2 months after the initial application, when areas missed can be dealt with effectively. In bole applications the hormone-dieselene mixture must be applied equally round the tree on living wood or bark.

Carrier or Spreader for 2,4-D

Water is used in over-all spraying and aromatic oils such as dieselene or kerosene in bole and stump applications. As in the treatment of gorse and blackberry the incorporation of an aromatic oil in the mix for over-all spraying would result in leaf burn or scorch with subsequent recovery. In the bole and stump applications the dieselene serves as both carrier and penetrant. Further trial work may show the possibility of a concentrated hormone-dieselene mixture being effective when applied equally over the trees in the dormant season.

Formulations

Little difference has been detected in the efficiency of 2,4-D oil-based esters and similar 2,4,5-T preparations; 2,4-D is probably slightly more toxic. Better results have been obtained with volatile preparations of 2,4-D in over-all spray treatments owing to a better cover. For bole and stump applications non-volatile and volatile oil-based esters give the same results. The question of penetrants is important, and further trial work may discover some that will penetrate the bark without the need for frilling.

WEEDS IN CROPS

Weed control in crops is difficult because the susceptibility of the crop has to be taken into account. The weed growth should be identified to determine whether or not the crop is sufficiently tolerant to allow weed eradication. Only the D.N.B.P. preparations of the phenol weedkillers are marketed in New Zealand at present; they kill only fleshy or succulent annual and perennial seedlings under 6in. high or waxy plants in the seed-leaf stage. Perennial plants arising from suckers, for example, Californian thistle, are checked temporarily, not destroyed. When hormone weedkillers are used the sodium salt of M.C.P. only should be employed, except for those autumn- and winter-sown cereals resistant to other forms of hormone weedkillers. As the sodium salt is very selective, only weeds that are susceptible, as given in Table 8, can be controlled successfully when growing in crops.

Tolerance of Crops and Control Methods

Crops show varying tolerance to weedkillers and may be divided into susceptible, moderately tolerant, and tolerant types. Susceptible crops are legumes without waxy leaves, brassicas (turnips, swedes, cabbage group, etc.), tomatoes, beets, carrots, parsnips, onions, grapes, cucurbits (pumpkins, marrows, etc.), kumaras, and ornamental plants. Among the moderately tolerant crops are potatoes, peas, linseed, linen flax, and some clovers. Crops of the grass family are resistant to hormone weedkillers at normal rates of application, and woody perennials such as loganberry, blackberry, raspberry, currant, and established strawberries are tolerant to metallic salt preparations of M.C.P. and 2,4-D.

Susceptible Crops

For control of weeds in susceptible crops the following methods are used:—

Pre-planting Method

Pre-planting control is carried out before the crops are sown. Methods conducive to weed-seed germination are adopted. Germinating weed seeds are sprayed 2 to 3 weeks before the crop is sown. The sowing is done with as little disturbance of the ground as possible. Best results will be obtained if a volatile oil-based ester of 2,4-D is used, as this material does not readily affect the plant through the roots. The salt preparations, particularly of M.C.P., should not be used, as they may be absorbed through the roots in lethal amounts and remain in

TABLE 7—TOLERANCE OF MISCELLANEOUS SCRUB WEEDS TO HORMONE WEEDKILLERS

Weed	Recommended formulation and rate of acid equivalent per acre	Most effective stage of growth	Time of year for treatment	Remarks
PERENNIALS (Taprooted) Broom (*Cytisus monspessulanis, C. scoparius*) Goat's rue (*Galega officinalis*) Horehound (*Marrubium vulgare*) Kanuka (*Leptospermum ericoides*) Manuka (*L. scoparium*) Lupin (*Lupinus arboreum, L. lutens*) Tutu (*Coriaria sarmentosa*) Tutsan (*Hypericum androsaemum*)	For young plants (except manuka and kanuka, which require 3 to 4lb.) oil-based esters of 2,4,5-T at 1 to 2lb.; older plants (except manuka and kanuka) 2 to 3lb. Manuka and kanuka after they are about 6in. high develop a high degree of resistance and power of regrowth	In young stages of growth. Seedlings (at 2-leaf stage) of broom, lupin, and goat's rue are resistant and should be treated when past the 2 seed-leaf stage	Spring and autumn for young stages of growth; older plants best treated in the summer. Tutu should always be treated when in full leaf	Seedlings of broom, lupin, goat's rue, and tutsan are controlled with oil-based esters of 2,4-D at 1 to 2lb. Older plants are destroyed more effectively with 2,4,5-T. Manuka and kanuka if growing thickly are very difficult to wet all over; they should be treated when under 6in. high, that is, at that stage of growth when the seedlings can be killed by a contact killer
PERENNIALS (Spreading roots) Bidi-bidi (*Acaena* spp.) Spanish heath (*Erica lusitanica*) Sweet brier (*Rosa eglanteria*)	Esters of 2,4,5-T at 3 to 4lb.	Spanish heath as seedlings; bidi-bidi and sweet brier when in full leaf	Summer	Established plants of bidi-bidi and sweet brier and possibly Spanish heath require repeat applications for final destruction. Sweet brier shows promise of being controlled with basal applications of 2,4,5-T and dieselene (1 : 10) in the dormant season. Mature plants of Spanish heath may also be controlled by the application of 2,4,5-T and dieselene (1 : 20) to the stump

TABLE 8—TOLERANCE OF COMMON CROP WEEDS TO HORMONE WEEDKILLERS

Weed	Recommended formulation and rate of acid equivalent per acre	Most effective stage of growth	Time of year for treatment	Remarks
ANNUALS **1. Susceptible** Black nightshade (*Solanum nigrum*) Fat-hen (*Chenopodium album*) Red deadnettle (*Lamium purpureum*) Redroot (*Amaranthus retroflexus*) Shepherd's purse (*Capsella bursa-pastoris*) Sowthistle (*Sonchus oleraceus*) Speedwell (*Veronica arvensis*) Twin cress (*Coronopus didymus*) Wild turnip (*Brassica campestris*)	Sodium salt of M. C. P.: For seedlings 0.5lb.; older plants up to 1lb.	As seedlings, but plants show effect up to flower-head formation	Spring and autumn	Weeds growing in autumn- or winter-sown cereals are destroyed very effectively by salts of 2,4-D, amines of 2,4-D, and esters of 2,4-D
2. Moderately tolerant Curnow's curse (*Calandrinia caulescens*) Mouse-eared chickweed (*Cerastium glomeratum*) Spurry or yarr (*Spergula arvensis*)	Esters of 2,4-D: For seedlings 0.5lb.; older plants 1lb.	As seedlings, but plants show effect up to flower-head formation	Spring and autumn	Weeds cannot be destroyed effectively when growing in susceptible crops, for example, peas
3. Resistant Redshank (*Polygonum persicaria*)	Esters of 2,4-D: For seedlings 1 to 2lb.	As seedlings	Spring and autumn	Plant shows high degree of resistance at later stages of growth
PERENNIALS (Spreading roots) **1. Susceptible** Hoary cress (*Cardaria draba*)	Salts of M.C.P.: For seedlings 0.5lb.; older plants 1lb.	As seedlings, but plants susceptible up to flowering stage	Spring	Plant is susceptible, but repeat applications are necessary to destroy it. It is checked by D.N.O.C. and D.N.B.P. products
2. Moderately tolerant Bladder campion (*Silene cucubalus*) Field chickweed (*Cerastium arvense*)	Esters of 2,4-D: For seedlings 0.5lb.; older plants 1lb.	As seedlings, but plants show susceptibility up to flower-head formation	Spring	Plants require repeat applications for final destruction; they offer too high a resistance to be killed in susceptible crops

toxic doses in the soil for a considerable period. Control by this method is usually good, as the weeds are treated as seedlings, their most susceptible stage. Both germinating grasses and broad-leaved seedlings are killed, but perennial weeds establishing from suckers are checked but not killed.

The pre-planting method is suitable for small seeded susceptible crops such as brassicas and beets that cannot be treated by pre-emergence spraying.

Pre-emergence Methods

For pre-emergence control an application of weedkiller is made after the seed is sown but before emergence of the crop. Pre-emergence treatments are of two types as follows:—

Contact pre-emergence control: Contact chemicals are applied. The usual preparations are the phenols, either in water or in oil. The phenols dissipate very quickly in soil and therefore are safer than the hormone preparations, which remain in the soil for a considerable period. The application is made 1 to 2 days before the crop emerges.

For **residual pre-emergence control** hormone weedkillers are used. This method is most successful with large-seeded crops that are planted deeply and possess either waxy sheaths or seed coats which enclose the growing points until they have emerged from the soil. The soil types most suitable for residual pre-emergence work are those high in clay or organic materials. Sandy soils are unsafe, as the weedkillers are readily leached or washed down to the roots of the germinating crop; also it is important that the soils be moist to enable the weedkillers to be activated. Mode of entry is through the roots of the weeds.

The hormone preparations used are the sodium salts of M.C.P. and 2,4-D; they are applied 1 to 2 days before emergence of the plants. These preparations, particularly the sodium salt of M.C.P., remain in the soil for a considerable period, depending on soil type, rainfall, and other factors. The average rate of application per acre is 1 to 2lb. of acid equivalent of the sodium salt of either M.C.P. or 2,4-D. This is a non-selective dose, killing germinating seeds of both grasses and broad-leaved plants, small-seeded weeds being eradicated most easily. Large-seeded species are more tolerant, particularly if well buried. Perennial plants arising from suckers are also difficult to control.

TABLE 9—APPLICATION OF GRASS-WEED KILLERS

Material	Type of weed	Method of application	Rate per acre (lb.)
I.P.P.C.	Annual and perennial seedlings	To soil after cultivation	1 to 2
T.C.A.			5 to 15
I.P.P.C.	Established annuals	To soil after cultivation	3 to 4
T.C.A.			15 to 25
T.C.A.	Stoloniferous perennials (established)	To upturned sod	25 to 40
		After mowing, burning, etc.	30 to 50
		On rank growth	40 to 60
	Rhizomatous perennials (established)	To upturned sod	35 to 50
		After mowing, burning, etc.	40 to 60
		On rank growth	50 to 75
	Fibrous-rooted perennials (established)	To upturned sod	50 to 75
		After mowing	60 to 80
		On rank growth	80 to 100

Californian thistle presents a problem when wheat is being harvested. A light application of hormone weedkiller will check the weed sufficiently to permit a clean harvest.

Crops most suitable for residual pre-emergence applications are maize (deeply planted), potatoes, asparagus, and most plants with corms or bulbs.

Tolerant and Moderately Tolerant Crops

The tolerant and moderately tolerant crops are controlled as follows.

Post-emergence Methods

Post-emergence control is applied to tolerant crops after the seedling plants break through the surface of the soil. The most selective of the hormone preparations, the sodium salt of M.C.P., should be used. In all cases the weeds should be identified carefully and if annual and perennial seedlings are present, the application should be made as early as possible. On the other hand, if the weeds consist mainly of plants arising from suckers, the spraying should be deferred to enable the weeds to be treated as near to the flowering stage as possible. This can be done only in tolerant crops.

Recommended treatments for the control of weeds in crops of varied tolerance are as follows:—

Tolerant

Ryegrass seed crops: Broad-leaved weeds are controlled effectively in ryegrass seed crops without damage to the crops. Once the crop has fully tillered it is resistant up to the pre-bud stage of the flower-head formation to hormone weedkillers applied at normal rates. The usual practice is to graze heavily, spray a week or so later, and close the area for seed.

As with ryegrass, **wheat**, **oats**, and **barley** are not damaged if they are treated after tillering but before the ear stage, that is, when the upper sheath is beginning to swell with an enlarging head. Only the most selective hormone preparation, the sodium salt of M.C.P., should be used for spring-sown cereals, but autumn- and winter-sown cereals are tolerant to the less selective preparations of 2,4-D. If the crops are underseeded with clovers, hormones should not be used unless a reduction in the clover stand can be tolerated. More suitable products are the D.N.B.P. preparations.

Though maize can be treated by the pre-emergence method, it shows sufficient tolerance to be treated by post-emergence methods. It is treated when 6 to 12in. high with the sodium salt of M.C.P. Wherever possible the spray should be directed at the base of the plants, although rates from 0.5 to 1lb. of acid equivalent per acre do little damage if applied to the whole plant when it is 6 to 12in. high. In all cases the spray must be directed to contact the tops of the weeds, ensuring a complete cover of weed growth.

Moderately Tolerant

For the treatment of moderately tolerant crops the same conditions apply as for tolerant crops, but the rates of application are less. Only the most selective preparation, the sodium salt of M.C.P., should be used.

Regrowth of Manchurian ricegrass after an application of 1 ton of sodium chlorate per acre on a partially submerged infestation at the Department of Agriculture's Dargaville Demonstration Farm. In the Dargaville district the weed causes a serious problem in drains and rivers. Though its spread on to dry land may be controlled with T.C.A. or sodium chlorate, it is difficult to kill when growing in water.

Moderately tolerant crops include the following:—

Potatoes: Much more experimental work on the tolerance of potatoes is required, particularly on varietal response. It has been noted, for example, that Katahdin tolerates higher amounts of weedkillers than the taller-growing varieties. The stage of growth is of no significance provided the spraying is carried out several weeks before flowering begins. The rates of application should be 0.25 to 0.75lb. of acid equivalent per acre. Seed should not be saved from the sprayed plants. It is noteworthy that the sodium salt of M.C.P. is compatible with basic copper and Bordeaux mixtures.

Peas will tolerate up to 0.5lb. of acid equivalent of the sodium salt of M.C.P. per acre without showing appreciable damage or yield reduction. The application is made after the four-node stage and well before flower-head formation. Risk of damage is greater if the crop has grown rapidly and is more succulent. A more suitable product is the ammonium salt of D.N.B.P. If this material is used, the leaves must be dry, and it is preferable for the spraying to be done after 2 fine days. Particular care must be taken to avoid overlapping of the spray material, as excess of spray will cause damage.

Linseed is treated when it is 4 to 12in. high with up to 0.75lb. of acid equivalent per acre of the sodium salt of M.C.P. Some temporary bending may occur, but yield is not reduced.

Clovers: Perennial clovers may be treated with sodium salt of M.C.P. at rates of up to 0.5lb. of acid equivalent per acre after the four true-leaf stage. White clover is more tolerant than red clover. If the crop is closed for seed, no application should be made near the time of flower-head formation. Annual clovers are destroyed readily by hormone weedkillers, and weed species such as burr clover may be taken out of established perennial clover stands. With D.N.B.P. preparations successful applications may be made after perennial clovers have reached the four true-leaf stage; at least 3 days' fine weather should precede the application. If the weather is wet, the spraying should be delayed, and if weed growth is too big to be controlled with D.N.B.P. products, the D.N.O.C. materials should be used.

For **lucerne** the same methods apply as for the treatment of clovers with the D.N.B.P. preparations. The lucerne should be in the 2- to 3-leaf stage before the first application. Later sprayings on mature plants may be made after the last cut in autumn and before the lucerne recommences growth in the spring. On mature lucerne in the dormant season recommended rates of application are 2 to 6 pints of D.N.B.P. with 15 gallons of dieselene per acre with sufficient water to secure an even distribution. This preparation will control all winter annuals and check established perennials.

GRASS WEEDS

Grass weeds, grasses, and sedges are controlled with the weedkillers given in Table 3 in the first part of this article. As rates of application depend on the method employed, soil type, rainfall, and other factors, only a guide can be given as to the quantities required per acre. Rates of application should be based on local knowledge.

On soils with high clay content the rates of application should be increased by 5 to 10lb. to the acre. Up to 200lb. of T.C.A. per acre is required for soil sterilisation for grasses, and above 200lb. for non-grass species. Rates of 10 to 20lb. of T.C.A. will retard growth of established grasses, and rates of 5 to 15lb. will inhibit grass seed from germinating and establishing.

An important aspect of weed control is the control of grass weeds in broad-leaved crops, but much more experimental work is required before definite recommendations can be given.

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METEOROLOGICAL RECORDS FOR MARCH

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	63.0	— 0.8	78.3	41.8	0.87	6	— 3.31	0.37	25	180.0
Auckland	160	64.6	— 0.3	78.5	46.3	0.90	8	— 2.25	0.32	28	181.2
Tauranga	10	62.8	+ 0.2	79.3	35.9	0.77	8	— 3.33	0.31	14	226.2
Ruakura	131	58.6	— 2.6	77.8	28.4	0.94	8	— 2.04	0.56	15	177.2
Rotorua	969	59.3	— 1.2	78.0	34.8	1.41	8	— 2.46	0.61	4	
Gisborne	12	61.8	— 0.7	80.8	39.8	4.15	12	+ 0.45	1.67	28	204.2
New Plymouth ..	160	60.0	— 1.0	75.0	39.9	0.98	8	— 2.76	0.30	22	192.1
Napier	5	62.2	— 0.2	81.2	44.2	1.20	8	— 1.38	0.71	15	228.2
Karioi	2125	53.7	— 1.4	74.0	31.0	4.32	12	+ 1.98	1.40	4	
Wanganui	72	60.2	— 1.4	78.1	43.8	1.19	8	— 0.96	0.44	28	176.1
Palmerston North .	110	59.4	— 0.9	77.5	41.0	2.03	11	— 0.20	0.55	17	155.8
Waingawa	350	59.0	+ 0.0	81.0	36.4	3.07	12	+ 0.87	0.72	3	208.7
Wellington	415	58.6	— 0.8	78.1	42.5	2.72	10	— 0.46	0.98	25	188.9
Nelson	5	58.2	— 0.2	72.1	37.0	1.00	9	— 1.69	0.42	25	218.2
Blenheim	12	59.1	— 1.3	79.9	33.4	0.64	6	— 0.89	0.33	25	225.2
Hokitika	12	54.8	— 1.5	69.4	33.6	5.21	16	— 3.73	0.98	25	144.3
Hanmer Springs ..	1225	55.2	— 1.0	84.0	35.0	1.79	11	— 1.57	0.45	27	176.6
Christchurch ..	22	57.4	— 0.7	77.4	38.4	0.67	5	— 1.27	0.32	28	160.1
Ashburton	323	57.8	+ 0.0	89.6	35.2	0.98	5	— 1.22	0.33	17	146.6
Timaru	56	56.1	— 1.3	81.0	35.0	0.68	4	— 1.45	0.45	15	134.2
Alexandra	520	57.1	— 0.5	81.0	31.9	0.64	6	— 0.51	0.31	25	156.1
Taieri	80	54.8	— 0.4	78.5	34.8	1.82	14	— 0.25	0.55	25	114.6
Invercargill ..	32	53.8	— 0.9	75.0	32.0	6.86	23	+ 2.70	1.20	25	106.4

Table Mats

ONLY a little time and a small amount of money are needed to make a set of table mats that will save much washing and ironing of table linen. The mats are made of plywood or hardboard decorated in any of a number of ways and after being given a protective covering of clear enamel they are attractive and practical for any table setting—attractive because they can provide accents of colour to fit in with any scheme and practical because they are easily cleaned by being wiped with a damp cloth. The materials and equipment needed for making these mats and suggestions for decorations are given in this article by Helen Paine, Rural Sociologist, Department of Agriculture, Wellington.

MOST women appreciate any suggestion that helps them do a household task more easily or quickly, and table mats of plywood or hardboard save some of the weekly washing, starching, and ironing. They have many other advantages, for they are easy to store without fear of creasing and they obviate the need for insulating mats of cork or other material because the board protects a polished table from heat. They can be as attractive and colourful as any table cloth or set of linen table mats.

Materials

The plywood or hardboard should be cut the exact size desired in the finished mat. For a mat to hold a dinner plate and the surrounding silver 9in. by 14in. is large enough. Smaller mats are usually covered by the plate, with the silver placed on either side.

Pieces of wood of sufficient size can sometimes be obtained as waste cuts from a builder; otherwise the wood must be bought by the sheet. Having the board cut by a builder or somebody else with good equipment is a great help, but it can be cut quite simply with a small saw.

Size necessary for preparing the surface of the mat can be bought from a paint and wallpaper firm. It is mixed with water and heated to make either a glue or a glaze, both of which are required in making these mats.

To make the glue 2 parts of water are added to 1 part of size in an old tin or basin and heated over hot water. The mixture can be used only when it is hot, for it sets solid as it cools.

For the glaze 8 parts of water are mixed with 1 part of size and heated over water until the size is dissolved. The heating water should not boil.

A small tin of clear synthetic enamel is needed for coating the mat, and a paint brush is used to apply the size and enamel.

Felt or felt pieces, which must be a little larger in area than the mat, can be glued to the back for added protection from heat for the table. They are essential on plywood mats in case splinters of wood break off and scratch the table, but are not always necessary on hardboard.

Sandpaper and other small items of household equipment such as a razor blade and scissors are also needed.

When the hardboard or plywood has been cut it is first smoothed with coarse sandpaper, then the edges and corners are rounded slightly.

Decoration

People with imaginative ideas and the ability to create their own designs may prefer to paint directly on to the board with only a rough drawing for a guide. Others will be content to copy or adapt a suitable design. The design cannot be painted on to the board until two coats of size have been applied. The size is mixed as described for a glaze and painted over the smoothed surface with a brush. Oil paint is then the most suitable medium for carrying out the design, but poster paint could be used.

When the mat is decorated in that way the background is dark, but for a mat of light appearance a different treatment can be given. Either the mat can be painted with light enamel before being coated with size, or a good-quality drawing paper can be glued firmly to the wood base. Mats which have been enamelled are then coated with two layers of size, after which the design is painted in oils or poster colours.

If a drawing-paper background is used, care must be taken to ensure that the paper is glued firmly and smoothly to the edge of the board. Two layers of size should also coat this paper to prevent the clear synthetic enamel applied later from penetrating the paper. After treatment with size, oil or poster paint is again the most suitable medium for painting the design.

Materials and equipment needed in the making of hardboard table mats.

A hardboard mat being covered with cloth.

However, the design can be painted in water colours first and the size applied when the painting is completely dry. The painting in water colours may even be done before the paper is glued to the mat if great care is taken when the paper is stuck to the board.

People without confidence to paint their own designs and pictures still have many sources of decorative material available for the same type of mat. Reproductions of some paintings can make a most attractive set of table mats. They are glued to any of the backgrounds suggested—the plain board, the board painted, or the simple and most attractive background of the board covered with drawing paper. The prints should be chosen carefully for size and proportion in relation to the mats as well as for suitability. Each print should be glued firmly to the sized base and placed so that the surrounding background forms a well-proportioned mount. If the print covers the whole mat, the background is not needed, but this usually gives the picture an incomplete appearance.

A set of mats made in this way is very effective and the work is quite simple. The choice of pictures will depend largely on the taste of the person making the mats, but if a variety of prints is chosen, they should possess some characteristics in common. Similarity in colour scheme or subject matter or a collection of pictures by the same artist brings unity to the set. Abstract designs and prints of works of contemporary artists which might not be chosen to hang on a wall should be especially considered for this purpose, for as mats they are enjoyed for their design and colour rather than for the set values by which most people expect to judge pictures; they are seen for only brief periods, during which many an eye will become accustomed to the new forms and gradually learn to enjoy them.

When some form of design has been painted or pasted to it the mat is finished with a coat of clear synthetic enamel. Any edging that heightens the effect of the picture or a border around the mat should be added before the final coat of clear enamel, which is painted on to protect the painting or print and make it resistant to heat and moisture.

Similar mats can be decorated in many other ways. An attractive wallpaper with a definite pattern can be glued to the surface of the board in the way described for the drawing paper and coated with a layer of size; an edging or some other finishing touch may be added before the final coat of clear synthetic enamel is painted on. Gold and aluminium paints can be used for all this work in addition to the oil and poster paints suggested.

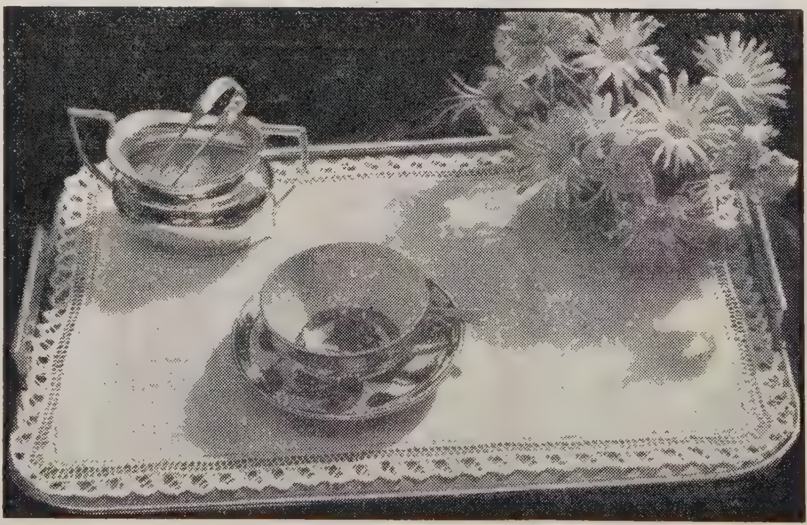
Figured cottons and linens can be used as decoration for hardboard and plywood mats. Almost any designs are suitable, but large units of design surrounded by a background colour usually look the most attractive. The design is placed in the centre of the mat with the background extending to the edge all round, each mat containing only one unit. The linen is attached to the mat with glue mixed from the size. It is smoothed over the board and attached firmly to the back. The overlapping edges of the linen can be sewn across the back of the mat so that when the linen dries it cannot pull away yet will be stretched tightly. A layer of size glaze and a coat of clear synthetic enamel complete a linen mat that does not need to be washed, starched, or ironed.

Though not necessary with all mats, a backing of felt improves most of them. A coating of glue is applied to the back of the board and on it is placed a piece of felt slightly larger than the board. When the glue is dry and the felt is firmly stuck the excess felt can be trimmed off with a razor blade.

Mats for children can be made with attractive animal and bird designs or with other motifs carried out in gay colours. Mats big enough for all the utensils used are a great advantage when a child first sits at the table. Special mats can be made to fit the tray of a high chair.

Trays made with a base of hardboard decorated in one of the ways mentioned would save much washing of tray cloths. Thicker pieces of wood can be made into heat-resistant stands for teapots, oven casseroles, and other utensils which come to the table very hot and can be decorated to match the table mats.

Neat Knitted Lace Edging



THE neat and attractive knitted lace edging illustrated can be made by following the instructions given here.

Materials required are: No. 8 crochet cotton (1 ball will make approximately 2yds.) and two No. 14 knitting needles.

Measurements: The width is just over 1in.

Abbreviations: K., knit; p., purl; st., stitch; tog., together; m., make; t.b.l., through back loop of stitch; sl., slip.

Cast on 8 st.

First row: Sl. 1, k. 2, m. 1, p. 2 tog., m. 2, p. 2 tog., k. 1 t.b.l.

Second row: Sl. 1, k. 2, p. 1, k. 2, m. 1. p. 2 tog., k. 1 t.b.l.

Third row: Sl. 1, k. 2, m. 1, p. 2 tog., k. 1, m. 2, p. 2 tog., k. 1 t.b.l.

Fourth row: Sl. 1, k. 2, p. 1, k. 3, m. 1, p. 2 tog., k. 1 t.b.l.

Fifth row: Sl. 1, k. 2, m. 1, p. 2 tog., k. 2, m. 2, p. 2 tog., k. 1 t.b.l.

Sixth row: Sl. 1, k. 2, p. 1, k. 4, m. 1, p. 2 tog., k. 1 t.b.l.

Seventh row: Sl. 1, k. 2, m. 1, p. 2 tog., k. 5, k. 1 t.b.l.

Eighth row: Cast off 3, k. 4, m. 1, p. 2 tog., k. 1 t.b.l.

Repeat from first row as required.

Attractive Cardigan of Simple Design

THE simple but attractive cardigan illustrated here can be made by following the directions given in this article. Instructions are given for three sizes. Materials required are 8oz. of 2-ply wool for the first size, 9oz. of 2-ply wool for the second size, 10oz. of 2-ply wool for the third size, two No. 10, two No. 11, and two No. 13 knitting needles, six buttons for the first and second sizes, and seven buttons for the third size.

THE measurements for the three sizes are:—

	First size	Second size	Third size
	in.	in.	in.
Bust	36–38	39–41	42–44
Length	20½	21	22
Sleeve seam ..	18	18	18½

The tension is 9 stitches and 12 rows to 1in. on No. 10 needles.

The abbreviations used are: K., knit; p., purl; st., stitch(es); in., inches; cont., continue; rep., repeat; beg., beginning; inc., increase; dec., decrease; patt., pattern; rem., remain; alt., alternate; sl., slip; p.s.s.o., pass slip stitch over; w.r.n., wool round needle; tog., together.

Note: Always count the number of stitches in a row on or after a second pattern row throughout the shaping. When casting off on a second pattern row always work the extra pattern stitches as 1 stitch. For the first size work as given; for the second size follow the first number of stitches, rows, or inches in parentheses; for the third size follow the second number in parentheses.

The Sleeves

With No. 13 needles cast on 62 (66, 70) st. and work 2½in. in k. 1, p. 1 rib.

Next row (first size): K. 1 * inc. in next st., rib 2. Rep. from * to last st., inc. in last st. (83 st.).

Next row (second size): K. twice into first st., k. 2, * k. twice into next st., k. 1, k. twice into next st., k. 2. Rep. from * to last 3 st., k. 3 (91 st.).

Next row (third size): * K. twice into first st., k. 2, k. twice into next st., k. 3. Rep. from * to end, inc. 1 st. in last st. (91 st.).

Change to No. 10 needles and cont. in patt. thus:—

First row: K. 1, p. 1, * sl. 1 purlwise, (p. 1, w.r.n., p. 1) all into next st., sl. 1 purlwise, p. 1. Rep. from * to last st., k. 1.

Second row: With the right side of the work facing the knitter k. 1, k. 2 tog., * k. 3, sl. 1, k. 2 tog., p.s.s.o. Rep. from * to last 6 st., k. 3, sl. 1, k. 1, p.s.s.o., k. 1.

Rep. these 2 rows, inc. 1 st. at each end of the fourth and every following tenth (tenth, eighth) row until there are 115 (123, 131) st. on the needle, working extra st. in stocking st. (1 row k., 1 row p.) until there are 4 inc. st., then work them into patt. Now cont. without shaping until the work measures 18 (18, 18½) in., ending with a first patt. row.

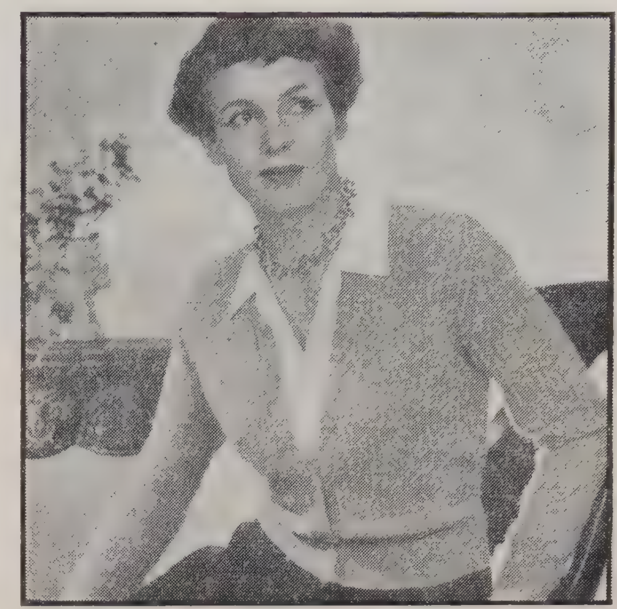
Shaping the top: Keeping continuity of patt., dec. 1 st. at each end of next and every alt. row until 61 st. rem., ending with a first patt. row. Now cast off 4 st. at beg. of next 10 rows. Cast off.

The Back

With No. 13 needles cast on 135 (151, 175) st. and work 3½in. in k. 1, p. 1 rib. Change to No. 10 needles and cont. in patt., inc. 1 st. at each end of the second and every following sixth row until there are 167 (183, 199) st. on the needle, counting at the end of a second patt. row, working extra st. in stocking st. until 4 st. are inc., then work them into patt. as for sleeve. Cont. in patt. without shaping until the work measures 12½ (12½, 13) in., ending with a first patt. row.

Shaping the armholes: Keeping continuity of patt., cast off 6 (8, 12) st. at beg. of next 2 rows, then dec. 1 st. at each end of alt. (alt., every) row until 127 (135, 143) st. rem., counting at end of a second patt. row. Cont. without shaping until the work measures 20½ (21, 22) in., ending with a first patt. row.

Shaping the shoulders: First and second sizes only: Cast off 16 st. at beg. of next 4 rows, then cast off 11 (13) st. at beg. of next 2 rows. Cast off. Third size: Cast off 16 st. at beg. of next 6 rows. Cast off.



The Right Front

With No. 13 needles cast on 63 (71, 83) st. and work 3½in. in k. 1, p. 1 rib. Change to No. 10 needles and cont. in patt., inc. 1 st. at end of second and every following sixth row until there are 79 (87, 95) st. on the needle, counting at the end of a second patt. row. Cont. without shaping until the work measures 12½ (12½, 13) in., ending at the shaped side edge.

Shaping the armhole: Keeping continuity of patt., cast off 6 (8, 12) st. at beg. of next row, then dec. 1 st. at this same edge on next and alt. (alt., every) rows until 59 (63, 67) st. rem. Cont. without shaping until the work measures 16½ (16½, 17) in., ending with a first patt. row. Change to No. 11 needles and cont. in patt. until the work measures 18½ (18½, 19) in., ending with a first patt. row. Change to No. 13 needles and cont. in patt. until the work measures 20½ (21, 22) in., ending at the armhole edge.

Shaping the shoulder: Next row: Cast off 16 (16, 18) st., patt. to end. Next row: Patt. to end. Rep. last 2 rows twice. Cast off.

The Left Front

Work exactly as instructed for the right front, but reverse the shaping by inc. for the side edge at the beg. of the second row after ribbing and of every following sixth row instead of at the end of these rows.

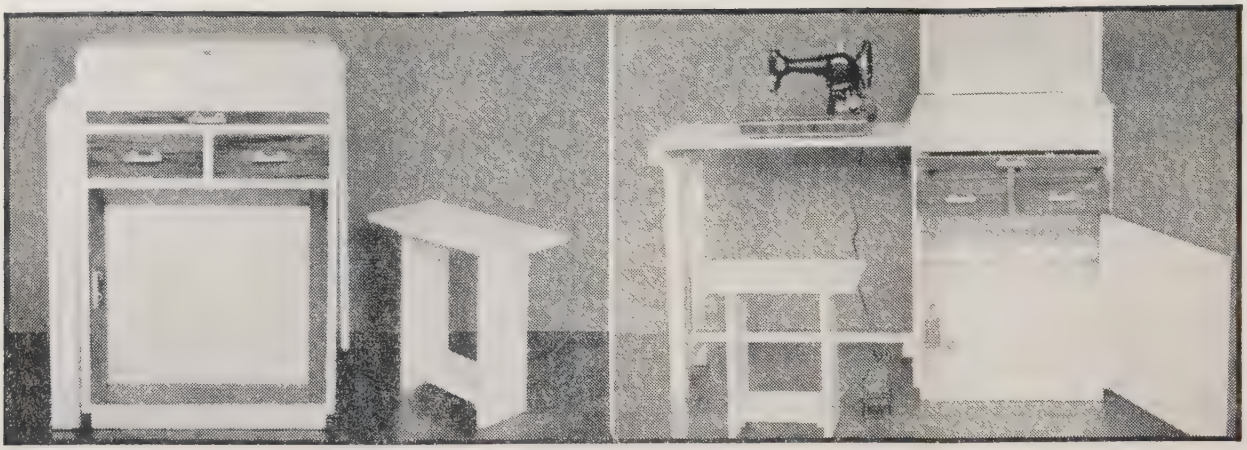
The Border

With No. 13 needles cast on 14 st. and work ½in. in k. 1, p. 1 rib. Next row: Rib 5, cast off 4 st. for buttonhole, rib to end. Next row: Rib 5, cast on 4, rib 5. Work 2 more buttonholes in the same way at intervals of 1¼in., then make 3 (3, 4) more buttonholes at intervals of 3 (3, 2½) in.

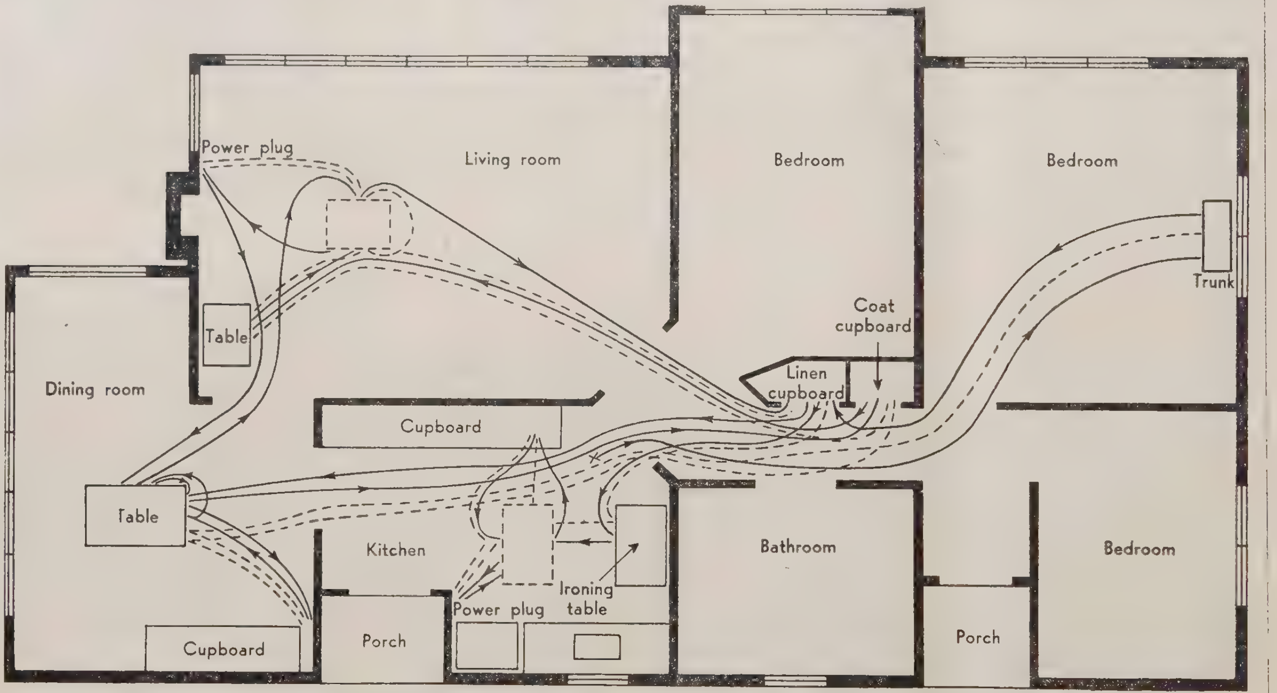
Cont. in rib after the sixth (sixth, seventh) buttonhole until the border measures about 47 (48, 50) in. or is the correct length to fit round the front and back of the neck edges when slightly stretched. Cast off in rib.

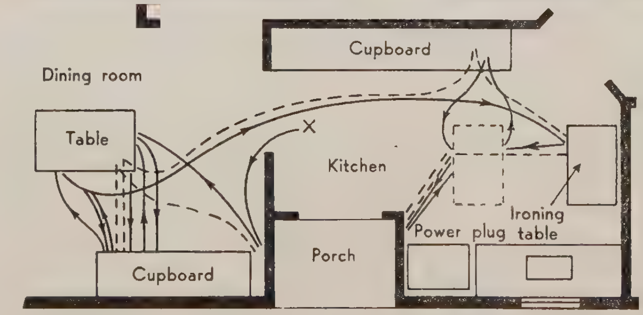
Making up the Cardigan

Press the work lightly on the wrong side with a hot iron and a damp cloth. Join the shoulder seams, easing the front to fit the back shoulder if necessary. Join the side and sleeve seams. Set in the sleeves, matching the seams, and sew with a backstitch seam. Sew the front border round the front and back of the neck edges, the top buttonhole level with the beginning of the armhole shaping. Sew on the buttons. Press the seams.



A sewing unit, shown closed and open, designed to accommodate materials and equipment.


Power plug
Living room
Bedroom
Bedroom
Trunk
Coat cupboard
Linen cupboard
Table
Dining room
Cupboard
Table
Kitchen
Ironing table
Power plug
Bathroom
Bedroom
Porch
Porch
Cupboard


Cupboard
Dining room
Table
Kitchen
Ironing table
Power plug
Porch
Cupboard

PLANS were made from two studies in the same house of distances travelled in assembling, using, and putting away sewing equipment and materials to make a simple apron. In the larger plan the equipment is scattered and in the smaller plan an attempt has been made to set up a sewing unit and minimise the distance travelled.

The worker was accustomed to walk from the kitchen to a trunk in a bedroom, collect materials, and walk back to the dining room table, picking up her sewing basket (containing small equipment) from the linen cupboard in the hall on the way. From the space behind the dining room cupboard she took the cloth that covered the polished table, spread it out, and cut out the apron on it. To set up the machine she had to go to the coat cupboard, get the machine out, and carry it to the living room because there was no power plug in the dining room. She left it on the floor while she moved a small table for it from a corner. She then plugged the machine into the power. She returned to the dining room to collect the materials, carried them to the machine, and sewed the apron. When sewing was completed she returned to the kitchen, collecting the ironing blanket from the linen cupboard on the way. She had to move the kitchen table toward the power plug, get the iron out of the kitchen cupboard, plug it in, and iron the apron. Then all the equipment had to be put away, as is shown in broken lines.

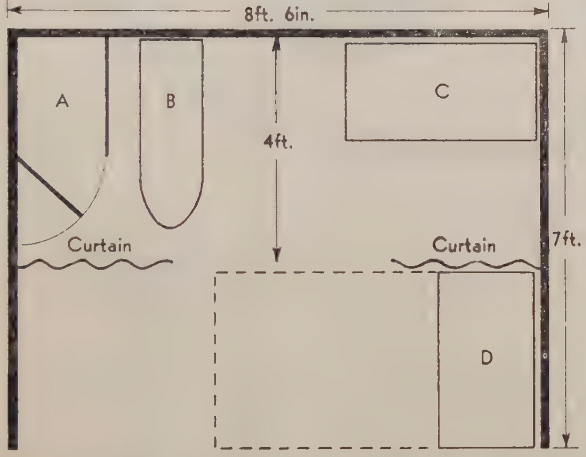
With no structural alterations except changing the fitting on the cord of the machine to one that would fit into a light socket, the equipment was rearranged so that most of it was kept in the dining room. Machine, patterns, ironing blanket, sewing basket, and materials were all kept in the dining room cupboard and the whole task was made much easier, as the smaller plan shows. The ironing was still done in the kitchen, but with the machine plugged into a light socket over the dining room table all other operations could be carried out in that room.

Planning a Sewing Unit

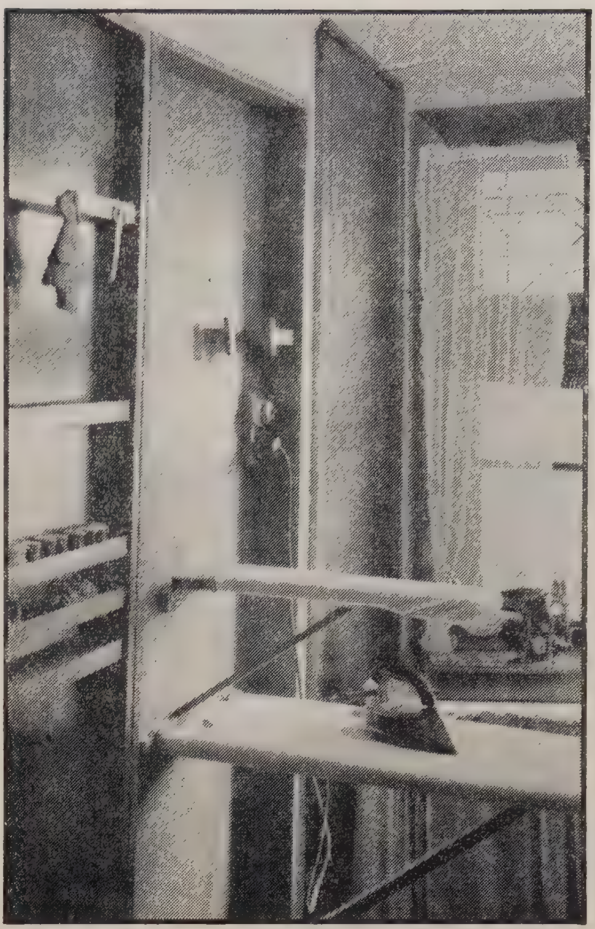
SEWING is a household activity that is often carried out with much irritation and wasted energy. It is usually done a little at a time to fit in with other household tasks, so much effort is spent in getting out and putting away the essential pieces of equipment. When these are scattered and disorganised the task is often made disagreeable, though it should be a source of great satisfaction as well as a successful economy. Suggestions for making sewing a simpler and more pleasant task are given in this article by Helen Paine, Rural Sociologist, Department of Agriculture, Wellington.

MOST WOMEN will agree that if a special place could be planned where all or most of the equipment used in sewing could be kept, many of the burdens of sewing for a family would be done away with. Sewing could be left out ready to be done between regular duties, odd jobs could be attended to easily in emergencies, and big sewing projects would be attempted more readily as part of the normal routine if the sewing centre was part of the household and did not have to be fitted up each time any work was to be done. Only a few people are fortunate enough to have a separate room set aside for sewing, and the design of many houses makes centralisation of equipment difficult, but it is worth making some effort to organise a sewing unit that is as satisfactory as possible.

Sewing Centre



Plan of a sewing centre in a special room, but which could also be organised at the end of a room or in an alcove. A—A cupboard for hanging part-made garments and storing a dress form, with a shelf above for storing bulk materials and perhaps a drawer at the bottom for patterns, iron, and other bulky pieces of equipment; there could be hooks for scissors and a scrap-bag or cloth pockets on the back of the door and a mirror on the front. B—An ironing board, which could fold up against the wall or be stored in the cupboard. C—A drop-head sewing machine or a cabinet with storage drawers for a portable machine. D—A gate-leg table, preferably with drawers in the centre piece to add to the storage space; such a table is ideal for a sewing room, as it can be stored close to the wall when not in use and opened partly or fully to give a large cutting-out area. With a fourth wall alongside the table the unit would become a separate sewing room, but if the unit were in an alcove, it could be closed off from the main room by curtains in the positions shown, leaving the table in the main room and shutting off the sewing alcove.



[*C. E. Clarke photo.*

Saving Steps

Before any sort of plan for a sewing unit is made it is a good idea to list all the articles used in sewing and mending. Some people will have only the bare necessities of needles, cottons, fastenings, and perhaps a machine; others who make even their own coats will have larger items of equipment, a dress form, many patterns, a sleeve board, or other items which present a difficult storage problem.

The main items of equipment will probably include a sewing machine, an ironing board and blanket, pressing cloths, a cutting-out table, a mirror, storage space for materials, patterns, and small items, and a wardrobe for hanging part-finished garments. Other equipment such as velvet boards and sleeve boards may be included, and many other items will differ from list to list.

Most persons will probably find that these pieces of equipment are scattered around the house as in the large house plan on the opposite page, which shows the distances travelled to get out and put away the equipment necessary for making an apron. The worker collected materials from the bedroom, the small equipment and the ironing blanket were kept in the linen cupboard in the hall, ironing was done in the kitchen, cutting out in the dining room, and sewing in the living room because it was the only room with a convenient electric point.

The smaller plan shows portion of the same house with the equipment rearranged so that most of the sewing can be done in the dining room and only ironing is carried out in the kitchen. The distance travelled to make the apron was reduced from 483ft. to 108ft. This result was achieved without any structural alteration except changing

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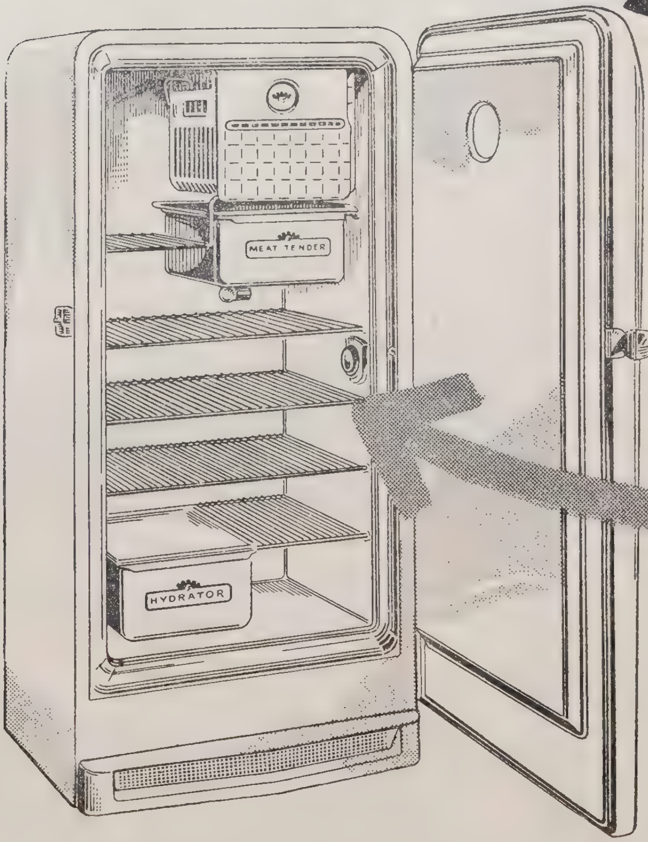

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the plug of the sewing machine cord to one that would fit into a light socket. The storage space was found with better arrangement of the dining room cupboard, where machine, sewing box, patterns, ironing blankets, and materials were kept.

With the sewing equipment in the house listed and the location of the major items taken stock of, possible places where a sewing unit could be planned may be listed. Then the best possible situation for sewing activities can be decided. This decision will be influenced by many factors. A few people will have a special room, but others may find a seldom-used corner of a bedroom, a place in the kitchen, laundry, or dining room, or an alcove off the living room; even the hall is a possibility. Next best to the special room set aside for sewing is a sunporch, often the centre of many activities, including a children's playroom.

With that decision made, the available space and the pieces of equipment that must be fitted into it should be measured and an attempt made to work out on paper the best arrangement.

Lighting and Power

The availability of lighting and, for an electric machine, power must be considered. The machine should be run from a 3-prong plug where possible; it may safely be connected to a light socket in some rooms, but care should be taken that a 3-prong plug is used in the kitchen.

When sewing is done during daylight the machine is best placed in front of a window where direct light will fall on the working area. If the sewing unit is to be enclosed in a cupboard or storage wall, good artificial light must be provided. A strip of fluorescent lighting at the back of a cupboard provides good illumination for the restricted area. Most electric machines have a small light attached to them, but a good general light is also necessary in a sewing room.

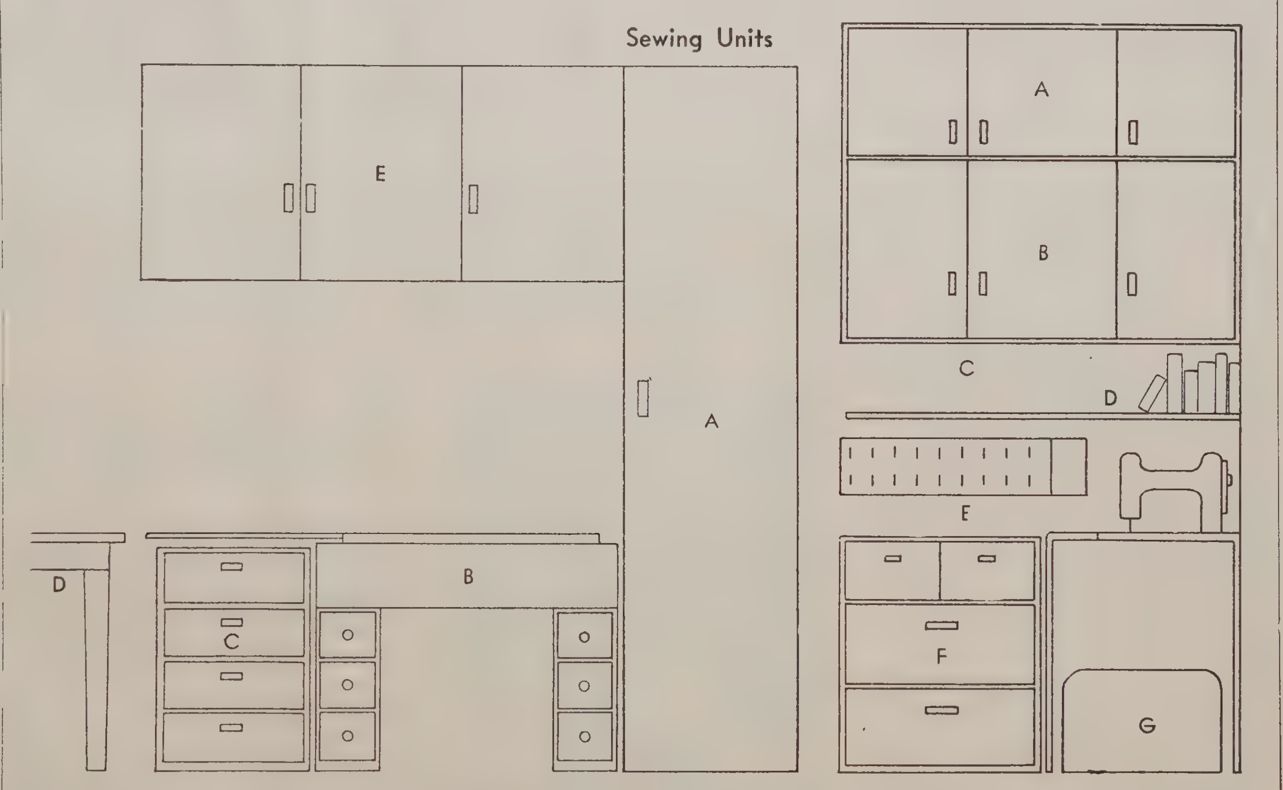
If most sewing is done at night, some direct light must be provided above the sewing machine; a light in the middle of the room is never adequate, as the person sewing will always throw a shadow on the work unless the machine is directly under the light.

If artificial light is used, the space above a machine can be occupied by storage shelves and is close at hand for small pieces of equipment, but this is achieved at the expense of the window, which would provide good natural illumination.

The Ideal

The ideal sewing room contains a sewing machine and cabinet with drawers, and possibly high cupboards above the cabinet for bulk storage; a wardrobe with mirror, shelves, hooks, and a large drawer at the bottom; a cutting-out table, preferably collapsible, and an iron and ironing board. All sewing processes could be carried out in such a centre. These items could be fitted into a minimum space of 8ft. 6in. x 7ft. 6in. and leave adequate room for all activities.

The same basic items for sewing could easily be fitted into an alcove off the end of a room, especially if the table were part of the main room, for then the amount of space taken up by the other sewing equipment would be



Sewing Units

Left—A sewing unit suitable for a corner of a kitchen or any other room with a large table. A—A wardrobe or cupboard as suggested in the plan of a sewing centre; it could be omitted if the unit is close to a bedroom cupboard where incomplete garments could be stored. B—The sewing machine. C—A small chest of drawers; if the machine is a drop head, the chest of drawers should be low enough for the flap to extend over it. D—A kitchen or dining table on which to cut out material; if the table is in the kitchen, it could be used for ironing, thus making the unit complete, but if it is a dining room table too good to be ironed on, a collapsible ironing board or an improvised table can be set up. E—Cupboard space above the machine for extra storage; if the machine is a drop head, the cupboards must be high enough to allow the flap to be folded over, but with an electric machine the cupboards and perhaps shelves could be built at a more convenient level. Right—A sewing unit incorporating an electric portable machine. A—Cupboards for bulk storage. B—Cupboards for patterns, equipment, and mending. C—Pegs and hooks for scissors. D—Narrow shelf for books. E—Pegs for cottons and storage for pins. F—Drawers for materials and an ironing blanket. G—Storage for the machine when it is not in use. A cupboard on the right could be used for hanging part-made clothes and storing a dress form.

much less. For convenience the alcove could be curtained off from the main room. An alcove off the end of a long room would have to be 8ft. 6in. wide for maximum comfort in this arrangement, but it need be only 4ft. deep.

The Next Best

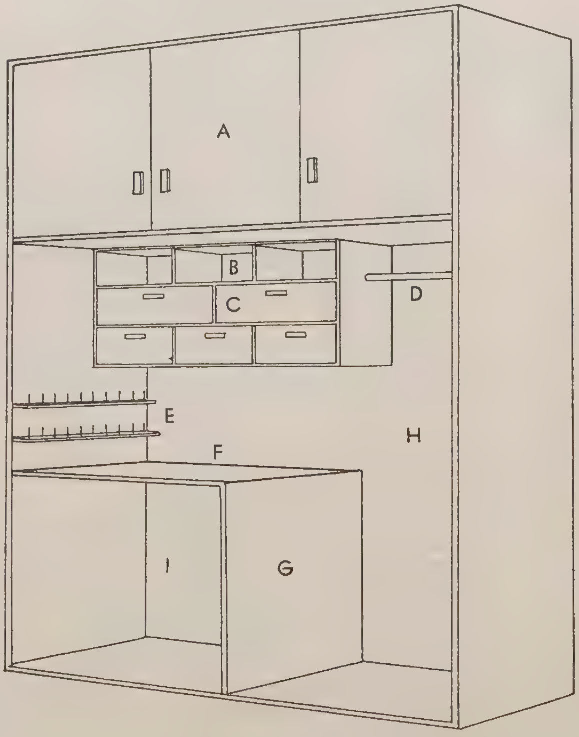
Failing the ideal of all equipment in one room, next best is to have all the essential equipment in one room, leaving only a few minor processes to be carried out elsewhere. With the sewing unit in the kitchen the iron, ironing board, and cutting-out table would usually be handy; if a well-planned shelf, drawer, and machine arrangement were built in, the unit would be complete except for hanging space and mirror, which would probably be together in the bedroom.

A similar arrangement could be set up in the bedroom; wardrobe space could be set aside for the unit, but ironing would probably have to be done away from the sewing centre unless it could be temporarily set up in the room. If there were enough room, a permanent ironing arrangement could be set up very conveniently in the bedroom, where it would serve for sewing and for small ironing jobs that need to be done while dressing.

In a bedroom the whole sewing unit could be shut off from the rest of the room by a screen, which would also hold oddments necessary for sewing. Cutting out would then be the only process that would have to be carried out in another room. Even this could be done in the bedroom if a large piece of 3-ply or hardboard were laid on the bed, temporarily converting it into a table.

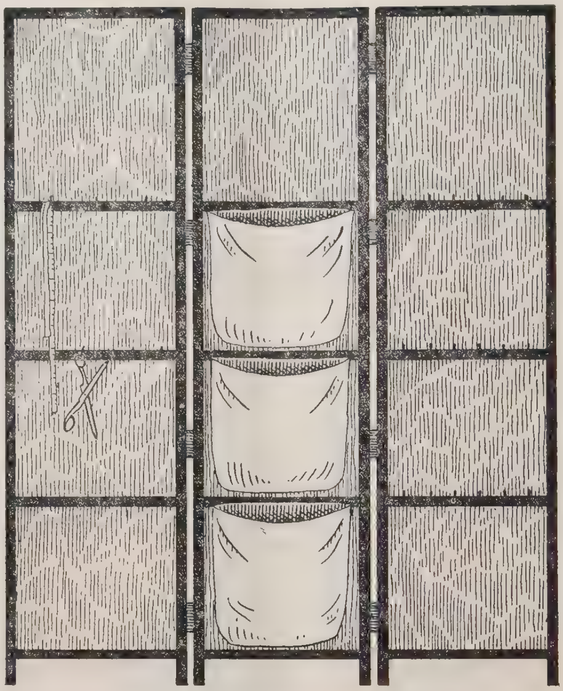
A sewing unit in the hall, living room, or dining room is probably best shut off as a storage wall or cabinet. This is possible with good arrangement of all the major items of equipment. A suggested design for a sewing cabinet that can be shut up completely is illustrated on this page. Cutting out is not done in the unit, which is designed for either a treadle or electric machine, but all other processes are, including ironing on the hinged flap. A mirror could be built on the inside of one cupboard door.

Sewing Cabinet



A sewing cabinet that could be built into a storage wall. Approximate dimensions are 7ft. 6in. high, 5ft. wide, and 2ft. deep. A—Bulk storage space. B—Pigeon holes for patterns. C—Drawers for small items. D—Hanging space for part-finished garments. E—Narrow shelves with pegs for cotton reels. F—Working surface which, when the hinged flap G is raised, is 5ft. wide. H—Space for storing a dress form and stand. I—Space for a treadle or electric sewing machine.

Dressmaking Screen



A dressmaking screen designed for the woman who makes many of her own clothes or those of members of the family. When not in use it screens off the sewing corner from the rest of the room and should be covered with material which harmonises with the decorative scheme of the room. The screen is about 5ft. 6in. high and consists of three panels each about 1ft. 6in. wide, one fitted with nails for reels of cotton, another with pockets for sewing supplies, and the third with rods for tape measures and hooks for scissors.

Organising Equipment

Without reorganisation of the large pieces of equipment the smaller items can sometimes be arranged so that they are more conveniently stored. A good idea is to store pins, shears, tape measures, and all other materials used in cutting out on a tray or in an old knife box; they can then all be carried to the cutting-out table at once. A scrap-bag suspended from a hook in a cupboard hides many untidy pieces.

A filing drawer is very suitable for storing patterns, but one can be improvised from an old shoe box, which is just the right size to allow the patterns to stand upright, so that any one can be sorted out easily when it is required.

A tray, a narrow shelf, or a shallow drawer is a good container for cotton reels. A piece of wood with wooden pegs or nails hammered into it holds cotton reels conveniently; smaller nails can be hammered into the board in front of the big ones to take bobbins that are filled with the same-coloured cotton.

Shallow drawers or cloth pockets are good hold-alls for needle cases, pin boxes or cushions, thimbles, domes, hooks and eyes, and other oddments. Strong hooks for scissors and a rail for tape measures are also useful.

Organising big pieces of equipment and smaller items to reduce to the minimum the effort required to collect and put away sewing materials should result in a great increase in the amount of sewing that can be done, partly because of greater convenience, but mostly because of lessened annoyance.

Cyclamen are not as Difficult to Grow as Many Gardeners Think

THOUGH generally regarded as a greenhouse plant, the cyclamen is really a half-hardy perennial which can be grown outdoors in the milder parts of New Zealand. Cyclamen are temperamental plants, but their culture is not really difficult, and in this month's article for the flower gardener C. K. Ellis, Horticulturist, Department of Agriculture, Dunedin, discusses the seasonal work involved in growing them in the home garden.

[*Green and Hahn Photography Ltd. photo.*
A year-old cyclamen at its first flowering.

WELL GROWN, cyclamen can provide a magnificent display of colour for a long time during winter, particularly when given the protection of glass. The colour range is now extremely wide, as in comparatively recent years shades of rich crimson, scarlet, cerise, rose, and salmon have been introduced and fixed.

The culture of cyclamen has long been considered rather difficult and many amateur gardeners, after one or two failures, have ceased attempting to grow them and have thereby given up one of the most satisfying crops both for general display and for winter and early-spring cut flowers.

The chief aspects of successful growing of cyclamen are that they demand a constant temperature of between 50 and 60 degrees F. throughout their growing season, a moderately humid atmosphere with free circulation of air, and abundant water. They dislike strong draughts and hot spring and summer sunshine but enjoy the maximum of light during winter.

Sowing the Seed

Seed may be sown during February, March, or April in pots or pans filled with a potting soil prepared by mixing 2 parts of rich, loamy soil with 1 part of leaf mould with the addition of enough sharp sand to ensure free drainage of surplus water. All constituents should be passed through a ⅜in.-mesh sieve and mixed thoroughly. The pots or pans should be well crocked by the placing of a large curved piece of broken pot over the drainage hole at the bottom with about an inch depth of small pieces of broken pots on top of it. A little sphagnum moss or flax fibre over the top of the crocking material prevents the soil from being washed down among it. The container is then filled with the soil to within an inch of the top and the soil pressed down moderately firmly. The surface should be made perfectly level.

As cyclamen are tender and soil pests can do them irreparable damage when the plants are in the seedling stage, watering the filled pots with boiling water through a fine-rosed watering can before sowing the seed is a wise precaution. When the soil has cooled, the seeds may be placed on the surface about an inch apart each way, covered with about ¼in. of fine soil, and either sprinkled again with water or tamped down moderately firmly so that the water will rise to the surface. The pots should then be placed in a well-protected position which will afford them a temperature not lower than 55 degrees F.

Germination and Potting

Cyclamen are rather slow and irregular in germination, so the appearance of only one or two seedlings through the soil several days or perhaps weeks before any others is no cause for worry. When most of the seeds have germinated the amount of light should be increased to prevent the seedlings from becoming drawn, but the temperature should remain about the same.

Immediately their leaves are touching each other the seedlings should be potted up into 3in. pots. The pots must be clean and only a very little crocking, if any, is necessary. Potting should be reasonably firm. At this stage the plants require plenty of diffused light and temperatures of 50 to 60 degrees F. During dry weather high humidity can be maintained by syringing around and over the plants a couple of times each day.

[*Douglas Elliott photo.*
Cyclamen blooming in a New Plymouth greenhouse.

Potting on for Flowering

By October the 3in. pots should be well filled with roots and the plants should be ready to be potted on into the 5in. or 6in. pots in which they will flower. The best soil for the final potting consists of 3 parts of good, rich loam and 1 part of leaf mould, with perhaps a little well-decayed animal manure finely sieved and very well mixed; a little bone meal and sharp sand added would be of advantage. Excellent drainage must be provided in this potting.

At this stage precaution should be taken against the cyclamen weevil, which can do great damage to cyclamen by eating away the roots from beneath the fleshy corm. A pinch of paradichlorobenzene on top of the fibre covering the crocking material before the potting soil is placed in the pot discourages this pest.

The fleshy corm must not be more than three-quarters covered with soil in the pot. If it is buried beneath the soil, moisture tends to lie about it and induce rotting.

The plants should be grown on in a cool place during summer and be syringed frequently to maintain high humidity. They need plenty of air but shade from bright sunlight. Growth is rapid during February and March and at this time of year they benefit from being given as much air as possible whenever the weather is favourable.

Subsequent Culture

From this point onward culture consists only of ensuring that the plants have sufficient light to prevent them from becoming drawn, that they are shaded from intense sunlight, that they are given a liberal supply of water, and that they are kept free from insect pests.

When the flower buds begin to appear the plants are improved by weekly feeds of weak liquid manure. This manuring must not be overdone, because plants supplied with too much readily available food at this stage tend to throw off their flower buds and produce masses of soft leaf growth. Immediately the first few flowers begin to show colour liquid feeding should be stopped or at least become very infrequent.

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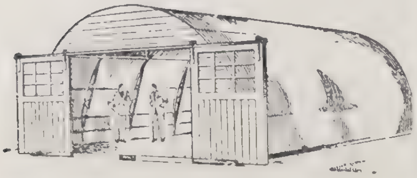
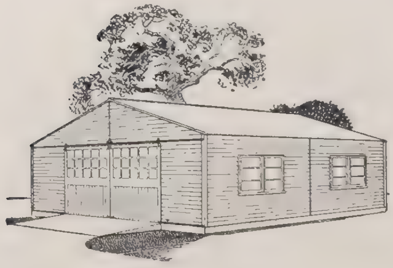


SIZES: 16ft. wide x 24ft., 30ft., 36ft., 42ft., 48ft., etc.



SIZES: 8ft. x 8ft., 8ft. x 16ft., 8ft. x 24ft., etc. 10ft. x 10ft., 10ft. x 20ft., 10ft. x 30ft., etc. 20ft. x 20ft., 20ft. x 30ft., 20ft. x 40ft., etc.

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Douglas Elliott photo
Chrysanthemum the Hon. Mrs. E. Helme-Potts, a representative of the exhibition type the culture of which is discussed on this page.

Pests of Cyclamen

Throughout their growing period cyclamen are particularly susceptible to the depredations of greenflies, thrips, and red spiders. If infestation by these pests is permitted, foliage soon curls up and the plants are damaged beyond repair.

A close watch must be kept for the arrival of such pests, and immediately they are detected all plants should be sprayed at 10-day intervals with a 1 : 800 solution of nicotine sulphate to which is added 6oz. of soft soap for each 5 gallons of water.

Red spider is the most difficult of the three to control, and for attacking it white oil should be added to the spray at the rate of 1 part in 100 of water. When oil is used in conjunction with nicotine no soft soap is necessary.

Green and Hahn Photography Ltd. photo.
A hydrangea flowering in a 6in. pot. Methods of influencing flower colour of hydrangeas by soil management are described on this page.

Bedding plants for spring flowering can be planted until the end of June in mild districts if the soil is not too wet for planting. Double daisies, primroses, polyanthus, violas, forget-me-nots, wallflowers, gaillardias, and sweet williams are all useful. The last four should be raised each year from seed sown in summer, and violas are best grown from cuttings taken in late summer. To increase double daisies and polyanthus the previous year's plants should be dug up, pulled apart, and each piece ("crown") with leaves and roots planted separately, the junction of roots and leaves being slightly below the surface.

Chrysanthemums of the late, large-flowered varieties grown in pots for exhibition need a very long growing season. When the flowers finally fade the stems should be cut down nearly to the ground, any long suckers cut back to soil level, and the pots stood in a light, airy place to await the growth of new suckers from below the ground. These make the best cuttings and should be removed for rooting as they appear.

Polyanthus, among other bedding plants, may be planted out in June where the weather is still mild and the soil not too heavy.

Fuchsias make good pot plants for the house. They are best raised afresh each year from cuttings, but if this year's pot fuchsias are to be kept to flower again next year, they should be dried off gradually until the leaves drop and then stood in a cool, frost-free place for their annual rest before being repotted and started into growth again in late winter.

Hydrangea flowers are most unusual in that their colour depends more on the nature of the soil than on the character of the variety. A variety that bears bright blue flowers in one garden may have pink ones in another, and even flowers of a metallic green in a third place. Varieties with naturally white flowers will not take on any other colour whatever treatment they are given, but the colour of other varieties can be changed more or less at will by suitable soil management. For pink colours the soil should be dressed with lime each winter at the rate of 4oz. to the square yard, or more if experience shows that this is not sufficient. Blue colours can be obtained by dressing the soil in winter with alum or aluminium sulphate scattered for a few feet around each bush at the rate of up to 1lb. or even more a square yard. Only experience can show how much aluminium sulphate is needed for satisfactory "blueing" in any soil, but if the flowers are not truly blue after a winter dressing, a further dose of aluminium sulphate dissolved in water can be applied in early summer. Though much cheaper than the aluminium salts, sulphate of iron does not usually produce such satisfactory blue colours, but is more likely to make the flowers a curious metallic green.

Lawns can be kept healthy only by regular feeding. The best dressing consists of 3 parts of sulphate of ammonia, 1 part of superphosphate, and 1 part of sulphate of iron applied evenly at the rate of 1oz. a square yard. This should be applied four times a year, a dressing being due in June unless the ground is very wet or the district is a very cold inland one, in which circumstances the midwinter dressing is probably better omitted.

"Pricking over" is the term gardeners use for shallow cultivation with a fork. Deep cultivation is very beneficial to the soil, but digging deeply between such subjects as shrubs, herbaceous plants, and roses is impracticable, as it would cause great damage to the roots of these plants, which would be seriously weakened. On the other hand, soil which is continually cultivated only by hoeing soon becomes too fine, tends to lose its crumby structure, and cakes badly after rain. At least once a year the ground between shrubs, herbaceous plants, roses, and other permanent crops should be pricked over with a fork, the handle of which should be kept low so that the tines do not penetrate deeply. The

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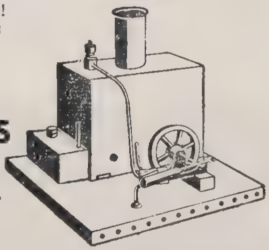

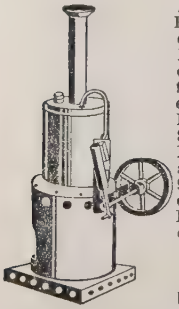

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soil should be left as lumpy as possible, no attempt being made to break the lumps down. At the same time any fallen leaves on the surface should be buried to rot and return humus.

Primroses or polyanthus flower well in the house if lifted in midwinter and potted up into bowls. Each plant should be lifted carefully, have the soil washed from its roots, and be planted in the bowl with moss or good potting compost packed firmly between the roots. The bowl should be stood in a sunny position, and water is needed only when the compost or moss feels dry to the touch, as overwatering will cause the roots to die and rot. The plants will grow and flower for weeks if potted in compost, but plants set out in moss show signs of starvation after a week or two and should then either be replaced by new ones or be fed with complete fertiliser.

Shrubs and trees can be planted in June, especially in light and sandy soil, if the ground is not too wet. Planting them is folly if the soil is too wet. Plants which come to hand from the nursery when the soil is in this condition should be heeled in at once to await more suitable conditions.

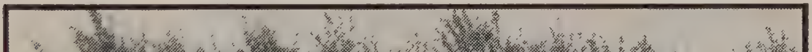
Stones set in path edges, retaining walls, and rockeries should be made quite firm by ramming of the soil thoroughly between, under, and around each stone as it is put in position. After each stone has been laid in a wall or rockery, and before another is added, it should be tested to make sure that it is rigid. However, even well-laid stones occasionally become loosened, especially after a dry season when the soil shrinks away from the faces of the stones. A loose stone is a menace to safety, as it can result in a nasty fall if it is stepped on, and stonework should be examined carefully each winter. Loose stones should be taken out and relaid, the soil being replaced a little at a time and very firmly rammed as the work proceeds.

[*Jack Welsh and Sons photo.*

Winter is the time to inspect stonework for loose components.

Summer bedding plants: Seed may be sown in boxes under glass in the mildest northern districts to provide plants for very early planting. Elsewhere June is still much too early to sow seeds, even under glass, as plants produced too early become starved in their boxes before they can be planted out.

Sweet peas succeed best in a site which has been specially prepared for them. The sooner this work can be put in hand during winter the better, provided the soil is not too wet, as it is an advantage to leave the site for some weeks to settle before the sweet peas are planted. Seed can still be sown in pots or boxes in a cold frame.



Pests and Diseases

Gladiolus corms should be examined periodically and the skins removed from a few to see whether they are still in good condition. Brown, sticky staining of the flesh is usually a sign that the corms are infested with thrips—small, active insects with slender, elongated bodies up to 1/10in. long when fully grown and ranging in colour from yellow to brown or black. Reports indicate that D.D.T. dust kills thrips in stored corms. A dust containing 5 per cent. of D.D.T. should be used at the rate of 1oz. of powder to each bushel of corms, which are then well shaken up in a bag to mix the powder thoroughly among them.

It is important to control thrips on gladiolus corms and not to plant the corms out while they are still infested with the insects, as that usually results in a heavy infestation on the new crops, which may be ruined if the season is a dry one favouring rapid building up of a big population of thrips.

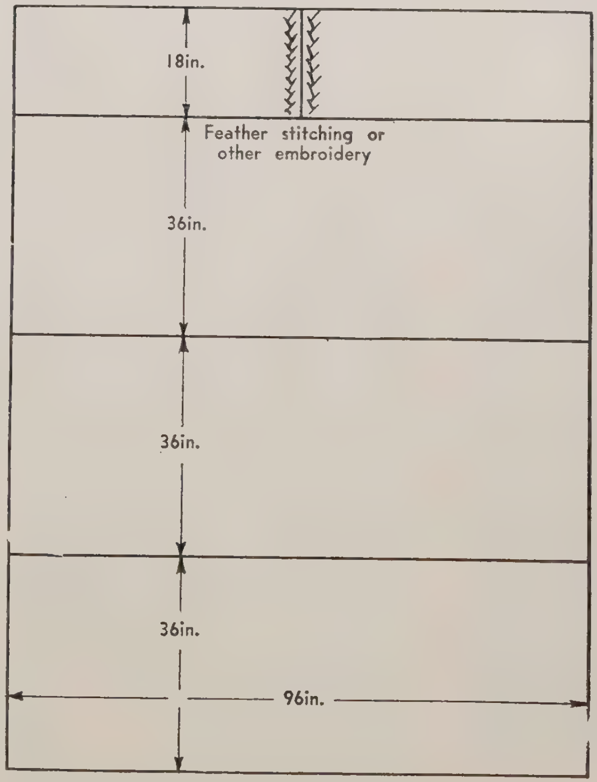
Escallonia hedges should be inspected for dead bushes or branches, which should be cut out at once and burnt. They have probably been killed by silver blight fungus, which is spread by spores produced on brown-purple growths that appear only on dead wood. Dead branches or bushes should be cut out and burnt before these growths have time to form.

[*N. W. Deverell photo.*

Escallonia hedges should not be allowed to get out of hand, as this one has, and need inspecting for bushes and branches killed by silver blight.

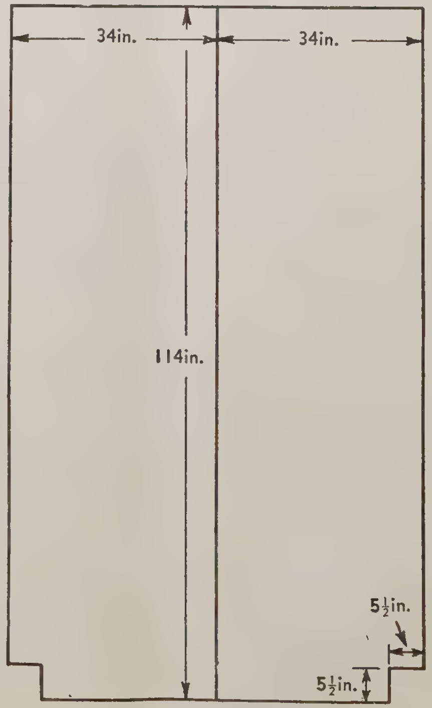
Materials and Measurements for Double Bedspreads

Style	36in. material	48in. material	54in. material
Throwover	1a— 105in. long x 94in. wide 8yds. of material ½in. seam allowance 1in. side hems ½in. end hems on selvedge Three widths crosswise No waste	4a— 106in. long x 93in. wide 6yds. of material ½in. seam allowance 1in. side hems 1in. top and bottom hems No waste	7a— 106in. long x 94in. wide 5⅓yds. of material ½in. seam allowance 1in. side hems ½in. end hems Material lengthwise across bed No waste
	1b— 122in. long x 94in. wide 9¼yds. of material ½in. seam allowance 1in. side hems ½in. top and bottom hems on selvedge 3½ widths crosswise No waste	4b— 124in. long x 93in. wide 7yds. of material ½in. seam allowance 1in. side hems 1in. top and bottom hems No waste	7b— 128in. long x 98in. wide 7⅓yds. of material 1in. seam allowance 4in. side hems 2in. top and end hems No waste
Gathered or pleated	2— 126in. long x 94in. wide 12⅓yds. of material ½in. seam allowance 3½in. side and bottom hems 1½in. top hem Waste: Two strips 114in. x 2in.	5— 125in. long x 93in. wide 8⅝yds. of material ½in. seam allowance 2in. top hem Selvedge on end and side skirts Waste: 2⅝yds. x 5in.	8— 126in. long x 93in. wide 8⅔yds. of material ½in. seam allowance 2in. side and bottom hems 2in. top hem Waste: 5⅔yds. x 8in.
Corner pleated	3a— 126in. long x 94in. wide 10¾yds. of material ½in. seam allowance 3½in. side and bottom hems 1½in. top hem Join in centre of end skirt Waste: Two strips 114in. x 2in.	6a— 125in. long x 93in. wide 7¼yds. of material ½in. seam allowance 2in. top hem Selvedge on end and side skirts Join in centre of end skirt Waste: 1¼yds. x 8in.	9a— 126in. long x 93in. wide 7¼yds. of material ½in. seam allowance 2in. side and bottom hems 2in. top hem Join in centre of end skirt Waste: 4¼yds. x 8in.
	3b— 126in. long x 94in. wide 11⅓yds. of material ½in. seam allowance 3½in. side and bottom hems 1½in. top hem No join in centre of end skirt Waste: Two strips 114in. x 2in. and 1½yds. x 18in.	6b— 125in. long x 93in. wide 8½yds. of material ½in. seam allowance 2in. top hem Selvedge on end and side skirts No join in centre of end skirt Waste: 2½yds. x 28in.	9b— 126in. long x 93in. wide 8yds. of material ½in. seam allowance 2in. side and bottom hems 2in. top hem No join in centre of end skirt Waste: Two strips 5ft. x 23in. and 5yds. x 8in.



Left—The layout of the seams in bedspread 1b. The embroidered seam lies where the two pillows meet end to end.

Right—The shape of the top cover of bedspread 3a or 3b, showing how the bottom corners are cut to fit over the corners of the mattress.



Double Bedspreads

[*Sparrow Industrial Pictures Ltd. photo.*

MAKING BEDSPREADS for single beds was the subject of an article in last month's "Journal". In this article Molly Macpherson, Rural Sociologist, Department of Agriculture, Auckland, describes the making of double bedspreads in the same three styles—throwover, gathered or pleated, and corner pleated.

A BED with a foot board may need only enough material to tuck in under the mattress foot—say, a length of 105 to 108in. A length of 120 to 128in. provides a floor-length end skirt which can completely cover a foot board which is only mattress height. If the foot board of the bed is high, an opening is needed at each bottom corner to allow the side skirts to go over the wire mattress support and hang to the floor inside the foot board of the bed.

Dimensions and sewing directions for various sizes of bedspreads and materials are detailed on the opposite page and below. The lengthwise grain of the material runs along the length of the bed unless otherwise stated. If the material has a one-way design and is used lengthwise, the pattern should run to the head board of the bed; if material with a one-way design is used crosswise, the pattern should run toward the main source of light in the bedroom, such as a window.

The pleated or gathered style requires the measured length plus half as much again for fullness in the side and end skirts. For the corner-pleat style sufficient material has been allowed for each half of the inverted pleat to be 4½in. deep, so that when the bedspread is turned inside out the corner pleat appears to be a box pleat measuring 9in. across.

Using the basic patterns given, many variations may be achieved by quilting or embroidery, and waste strips of material may be ruched and used to decorate the bedspread.

Sewing Details for Each Style and Width of Material

1a—Cut three lengths of material 96in. long and seam the lengths together along the selvedges so that the bedspread measures 106in. x 96in. The material runs crosswise in the finished bedspread.

1b—Cut three lengths of material 96in. long. Cut the remainder of the material into halves lengthwise and join them into one strip 96in. x 18in. Join all four lengths of the material together so that the seams run across the bed and the unhemmed bedspread measures 123in. x 96in. The seam joining the two narrow strips will lie where the two pillows are end to end, and this seam can be decorated with feather stitching or other embroidery.

2—Cut two lengths of material 114in. long for the top cover. Cut from one side of each length a strip 2in. wide. Join the two lengths of 114in. x 34in. to make the top cover 114in. x 67in. From the top cover cut out of each bottom corner a square 5½in. x 5½in. and join these cuts together to form corners to fit over the two bottom corners of the mattress. Cut the remainder of the material into halves lengthwise and join them into one strip 18in. wide for the side skirt. Gather or pleat the side skirt on to the top cover.

3a—Cut two lengths of material 114in. long for the top cover. Cut from one side of each length a strip 2in. wide. Join the two lengths of 114in. x 34in. together to make the top cover 114in. x 67in. From the top cover cut out of each bottom corner a square 5½in. x 5½in. and join these 5½in. cuts together to form two corners to fit over the bottom corners of the mattress. Cut the remainder of the material into halves lengthwise and join them into one strip 18in. wide for the side skirt. Place the joining seam of the side skirt at the centre of the bottom end of the top cover and attach the side skirt to the top cover, allowing 18in. for inverted pleats at each bottom corner.

3b—Cut and sew the top cover as in 3a. Cut the remainder of the material into halves lengthwise and join them into one strip 18in. wide for the side skirt. Join the side skirt to the top cover, beginning from a top corner of the bedspread. Allow 18in. for each inverted corner pleat at the bottom corners. The join in the side skirt is concealed in the second corner pleat.

4a and 4b—Cut the material into halves and join the two widths with a seam down the centre of the bedspread.

5—Cut from one side of the material a piece 6yds. x 20in.; this piece becomes part of the side skirt. Cut the 6yds. x 28in. piece into halves—two pieces 3yds. x 28in.—and seam them together to form the top cover 108in. x 55in. Cut from the middle of the remaining 2⅝yds. a strip 8in. wide; this piece is waste. Join the three 20in.-wide strips together to form one strip 20in. wide for the side skirt. Gather or pleat the side skirt on to the top cover.

6a—Cut from one side of the material a piece 6yds. x 20in. and cut it into two pieces 3yds. x 20in.; these become the side skirt. Cut the 6yds. x 28in. into two pieces 3yds. x 28in. and seam them together to form the top cover 108in. x 55in. Cut from the middle of the remaining 1¼yds. a strip 8in. wide (which is waste), leaving two strips 1¼yds. x 20in.; join these together for the end skirt. Join on each side of the end skirt the two strips 3yds. x 20in. cut from the top cover to form one strip 20in. wide. Place the centre of this long strip at the centre seam of the bottom of the top cover and attach the 20in. side skirt to the top cover, allowing sufficient material for the inverted pleat at each bottom corner and concealing the other seams in the side skirt in the inverted pleats. As extra material may be used in the inverted pleats to conceal the joins in the side skirt, the top cover is slightly longer than the side skirt at the top of the bedspread; turn a 2in. hem on the top cover and sufficient top hem on the side skirt to make a straight edge.

6b—Cut from one side of the material two pieces 3yds. x 20in.; these pieces become the two side skirts. Cut the piece 6yds. x 28in. into two pieces 3yds. x 28in. and seam them together to form the top cover 108in. x 55in. Cut from the remaining 2½yds. a strip 2½yds. x 20in. for the end skirt. To each end of the end skirt join one of the two side skirts. Place the centre of the end skirt to the centre of the bottom of the top cover, and attach the skirt to the top cover, allowing material for the inverted pleat at each bottom corner and concealing the joins in the side skirt in the inverted pleats. As extra material may be used in the inverted pleats to conceal the joins in the side skirt, the top cover is slightly longer than the side skirt at the top of the bedspread; turn a 2in. hem on the top cover and sufficient top hem on the side skirts to make a straight edge.

7a—Cut the material into two pieces 96in. x 54in. and join the two lengths along the selvedge. The material runs crosswise on the bed.

7b—Cut the material into two pieces 132in. x 54in. and join the two lengths along the selvedge. The material runs lengthwise on the bed.

8—Cut from the material a piece 3yds. long for the top cover. Cut a strip 5 2/3yds. x 8in. from the middle of the remainder of the material (this piece is waste), leaving two strips 5 2/3yds. x 23in. Join them to form one strip 23in. wide for the side skirt, and gather or pleat the side skirt on to the top cover.

9a—Cut from the material a piece 3yds. long for the top cover. Cut a strip 4¼yds. x 8in. from the middle of the remainder of the material (this piece is waste), leaving two strips 4¼yds. x 23in. Join them to form one strip 23in. wide for the side skirt. Place the centre of this strip at the centre of the bottom of the top cover and attach the side skirt to the top cover.

9b—Cut from the material a piece 3yds. long for the top cover. Cut from the centre of the remaining material a strip 5yds. x 8in., leaving two strips 5yds. x 23in. Join them to form one strip 23in. wide for the side skirt. Join the side skirt to the top cover, beginning from a top corner of the bedspread, and allow 18in. for each inverted corner pleat at the bottom corners. The join in the side skirt is concealed in the second corner pleat.

Cooking with Raw Sugar

IN recent years supplies of refined sugar have been uncertain from time to time and some consumers have been offered raw sugar as a supplement or substitute. This has created difficulties, because housewives have wondered if raw sugar is unsuitable for some types of cooking, and also because raw sugar has been confused with brown sugar. This article by Norma K. Metson, Rural Sociologist, Department of Agriculture, Wellington, explains the manufacture of raw sugar, how it differs from brown sugar, and how it may be used.

IN the manufacture of sugar the cane or beet is crushed and broken to extract the juice, which is then clarified by the use of lime, carbon dioxide, and heat. The clear juice is concentrated by evaporation until sugar crystals form, and the crystals are separated from the molasses liquor by being spun at high speed in a centrifuge. These crystals are raw sugar, which is yellow brown, slightly moist because some of the molasses clings to each crystal, acid in reaction, and with some flavour and odour. This is the usual form in which sugar is exported from producing countries to consuming countries, where it is further refined and purified.

The refining process removes the molasses and any surface impurities, precipitates a small amount of pectins and albumins, decolorises the sugar, and changes its reaction from slightly acid to neutral. White sugar is crystallised out from the refined liquor, and the residual syrup is used to make golden syrup and brown sugar; 106lb. of raw sugar will produce 100lb. of white sugar and 4lb. of residual syrup. The remainder is the impurities which have been removed and moisture which has evaporated. Raw sugar is 96 to 98 per cent. sucrose and 1 to 5 per cent. water, compared with white sugar, which is 99.9 per cent. sucrose.

Uses of Raw Sugar

In cooking, raw sugar is quite satisfactory for most purposes, but does have some limitations. It can be used for sweetening fruit which is to be stewed or which is to be used in fruit sponges, puddings, and pies.

When raw sugar is used in the baking of cakes, biscuits, and puddings, those which are perfectly plain, such as sponge cake or madeira cake, will have a noticeable flavour from the sugar. In richer recipes containing fruit and essences there will be little difference. To make darker cakes, some of the baking powder may be replaced by baking soda, which will react with the acidity of the sugar, as in recipes containing golden syrup or honey. As the crystals of raw sugar are larger than those of white sugar, the raw sugar should be creamed very thoroughly with the butter or the texture of the cake will be impaired.

For Jams and Preserved Fruits

If raw sugar is used for bottling, the syrup will be slightly cloudy and darker than syrup made with white sugar. The molasses flavour may tend to overpower that of the fruit, especially with delicately flavoured fruits, and the fruit may darken in keeping. However, the slight changes in appearance and flavour are the only disadvantages in using raw sugar for bottling, and the same applies to jam making. With the exception of jams made with delicately flavoured fruits such as strawberries and raspberries, where the period of boiling is short, the jam will be quite successful.

It is better not to use raw sugar when making a pouring custard with eggs, as the slight acidity of the sugar tends to produce curdling; also, those who like sugar in tea and coffee might object to the definite taste as well as sweetness given by raw sugar.

Washing Lace or Net Curtains

LACE or net curtains if not washed fairly frequently become so soiled that holes may be caused in the material when obstinate, wet, set stains are being removed during washing. If curtains are shaken to remove the dust, placed loosely in an old pillow slip or flour bag, and the top tied, they are less likely to tear during washing. The bag containing the curtains should be squeezed gently in plenty of warm, soapy water, rinsed quickly two or three times, and as much water as possible squeezed out. The curtains are taken out of the bag and pulled straight before being hung out. They should be hung lengthwise over the clothes line and pegged down the centre.

—NELL MACPHERSON,
Rural Sociologist, Department of Agriculture, Auckland

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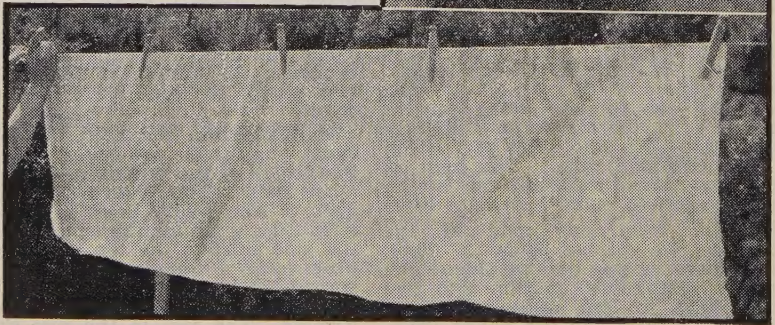

Rendering and Clarifying Household Fats

A NUMBER of different types of fats, in New Zealand nearly all of animal origin, are used in the home. Where home-killed meat is used there is often a large quantity of fatty tissue to be rendered down and clarified before it can be used either in cooking or in soap making, and methods of doing this are described here.

Rendering: Mince the fatty tissue or cut it into fairly small pieces. Place the fat in a saucepan and heat it over boiling water or place it in a baking dish in a slow oven and allow it to melt. Direct heat should not be used, as the fat may scorch or even catch fire.

Strain the melted fat through several thicknesses of cheese cloth.

Clarifying: Fat which has been used several times may become brown and need clarifying. If it has not been burnt, it can be clarified repeatedly.

Mix 1 cup of water with each pound of fat and add a peeled and sliced raw potato. Heat these gently until the fat has melted and the potato has gone brown, stirring them constantly to mix them thoroughly with the water. Allow the mixture to cool and lift the set fat off the water. Scrape the bottom of the fat.

The fat can be clarified without the use of water if it is heated until it stops bubbling and is then strained through two thicknesses of material.

—NELL MACPHERSON,
Rural Sociologist, Department of Agriculture, Auckland

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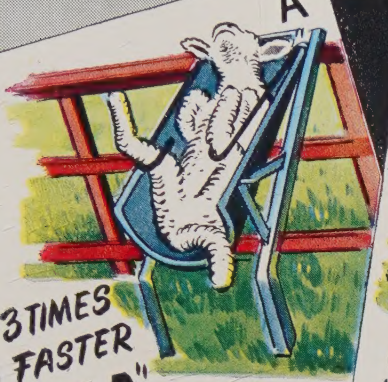

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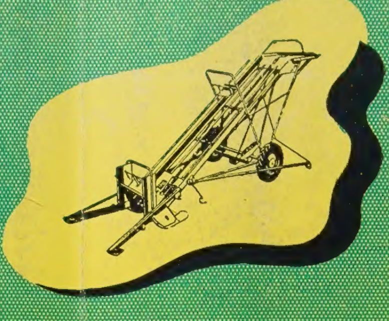

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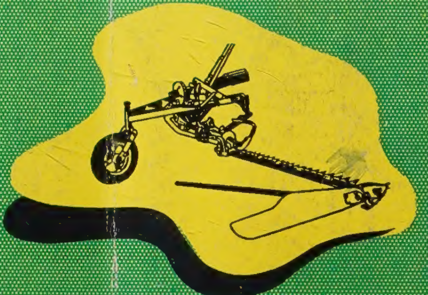

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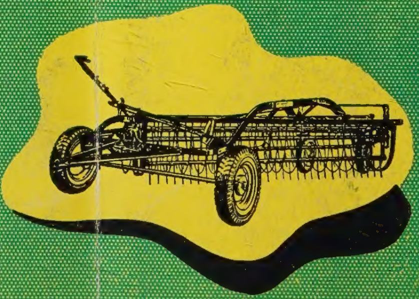

For faster and more efficient raking at tractor speeds. Exclusive Features include — enclosed Main Drive Gears, four-bar electric welded Reel, ball bearing Reel Eccentric, quick attachable Teeth and Pressure Lubrication. Simplified ground drive reduces maintenance, speeds connection to tractor.

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